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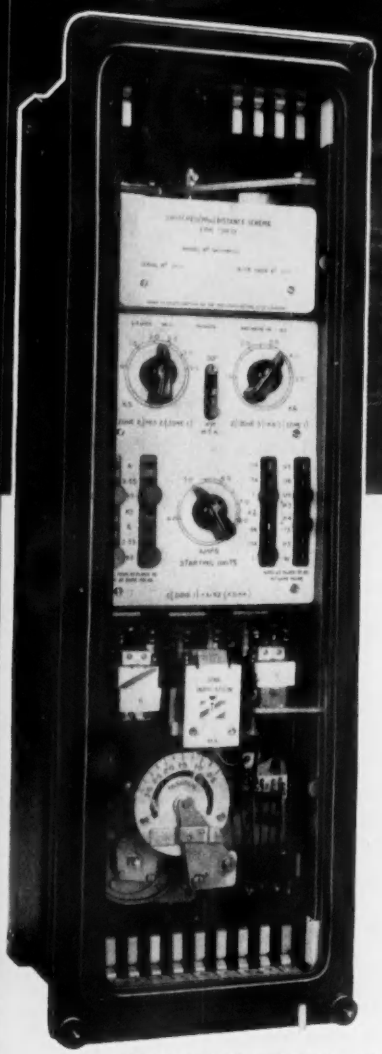

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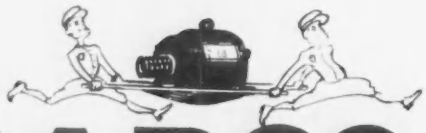

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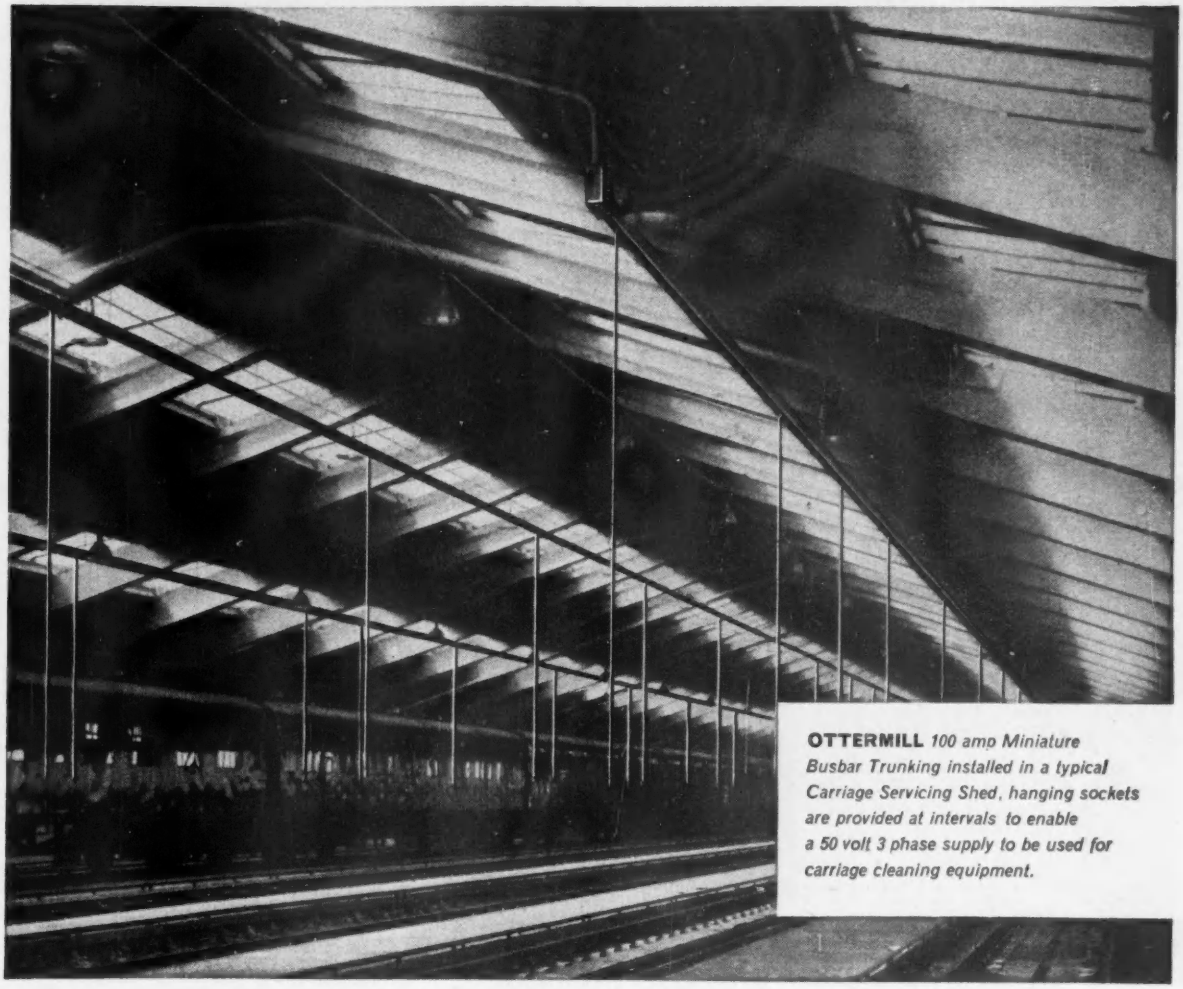

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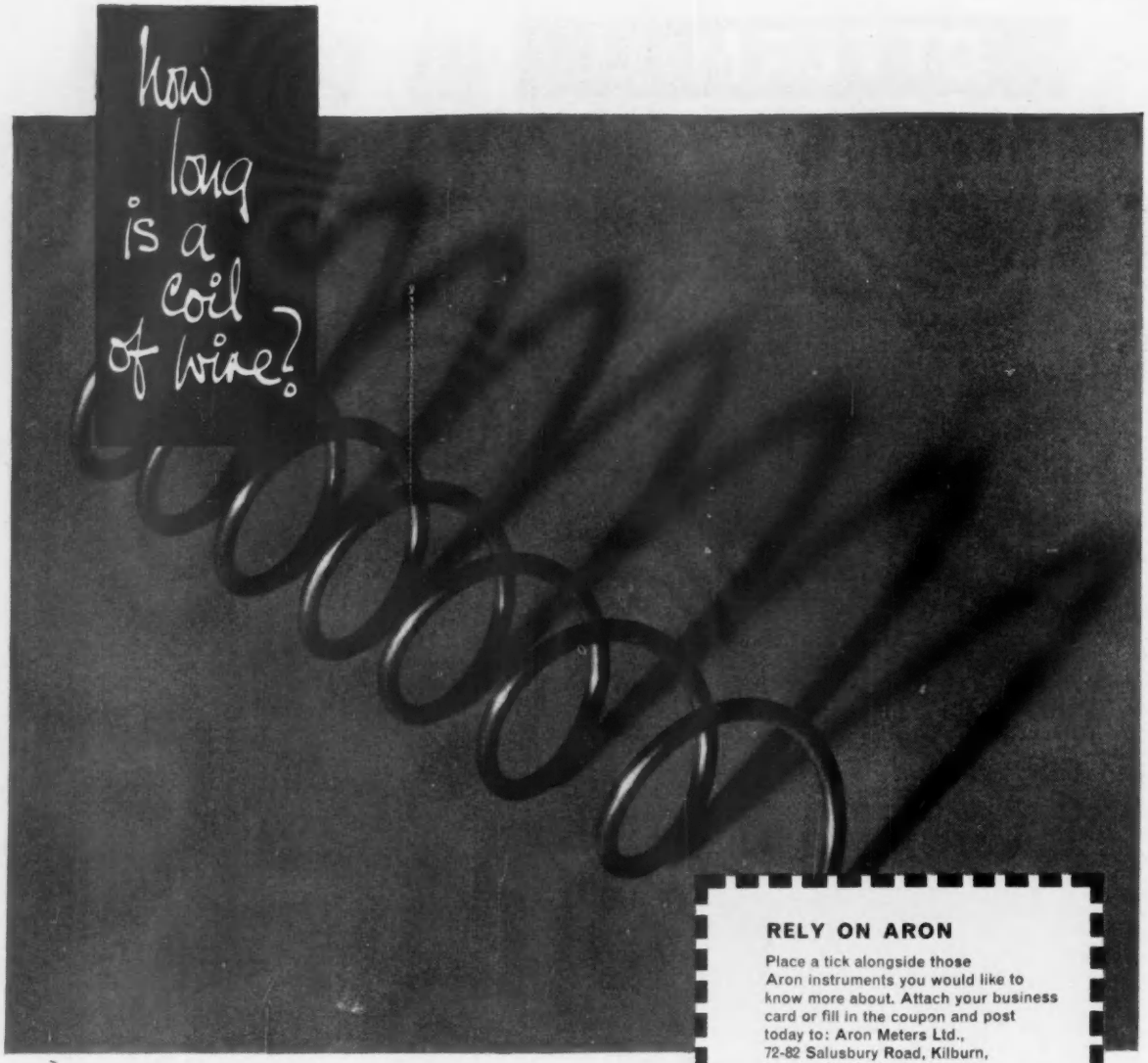

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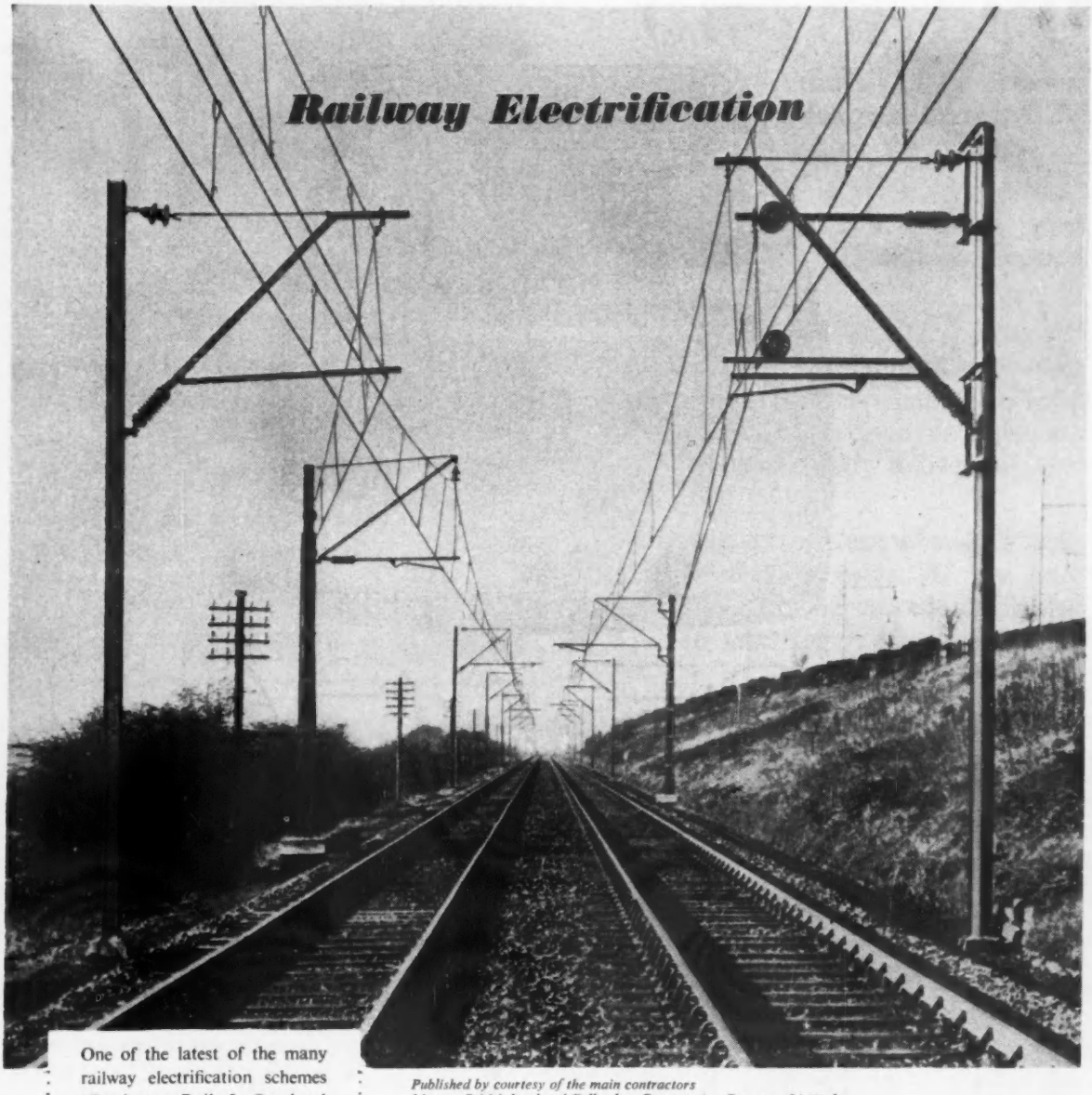
Railway Electrification



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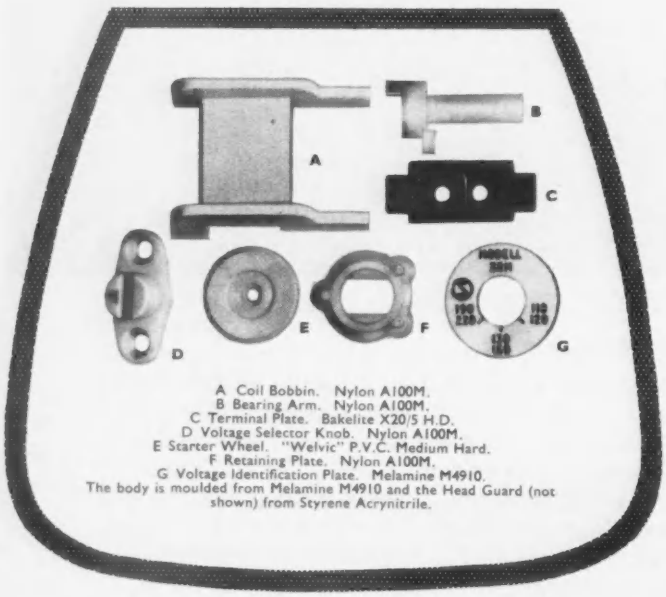

A Coil Bobbin. Nylon A100M.
B Bearing Arm. Nylon A100M.
C Terminal Plate. Bakelite X20/5 H.D.
D Voltage Selector Knob. Nylon A100M.
E Starter Wheel. "Welvic" P.V.C. Medium Hard.
F Retaining Plate. Nylon A100M.
G Voltage Identification Plate. Melamine M4910.
The body is moulded from Melamine M4910 and the Head Guard (not shown) from Styrene Acrynitrile.

In 1959 we published a series of three advertisements giving details of our services in connection with the Sunbeam Shavemaster. The fact that we can now give details of the Sunbeam Rollmaster Electric Shaver speaks for itself.

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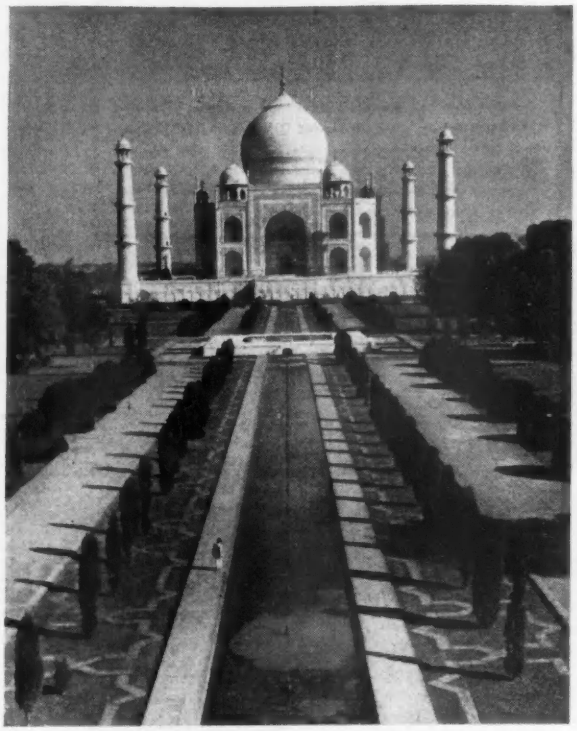

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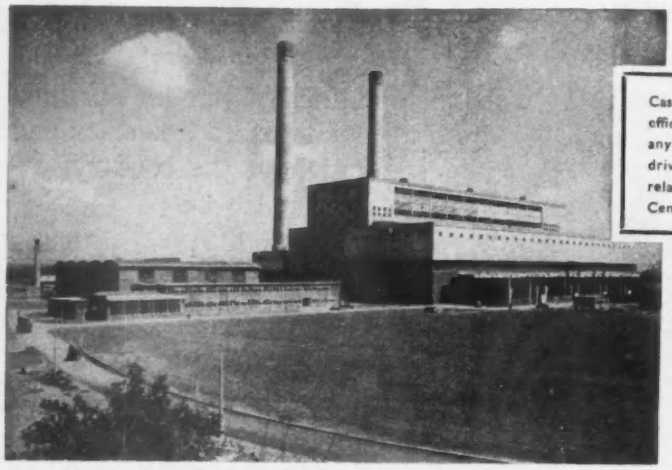
Service by Rickshaw in Durban, South Africa *(Photo by J. Allan Cash)*



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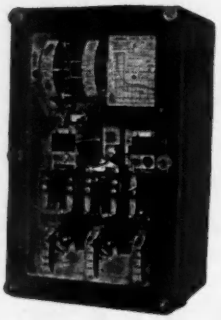

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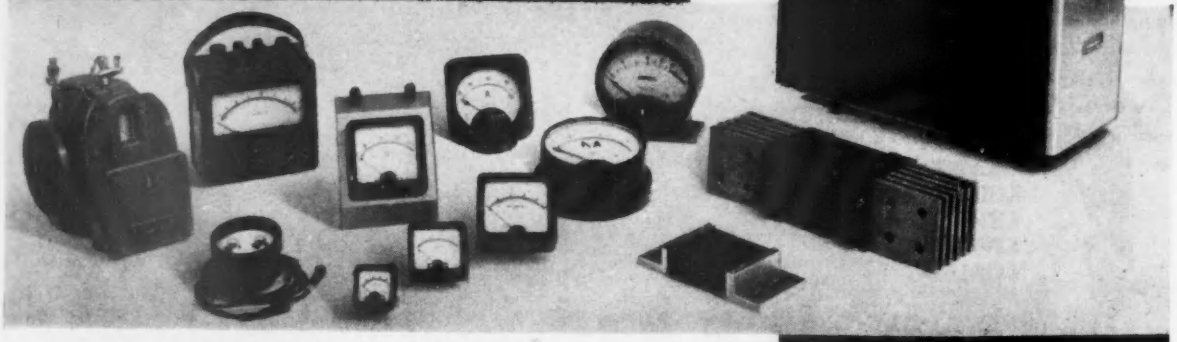

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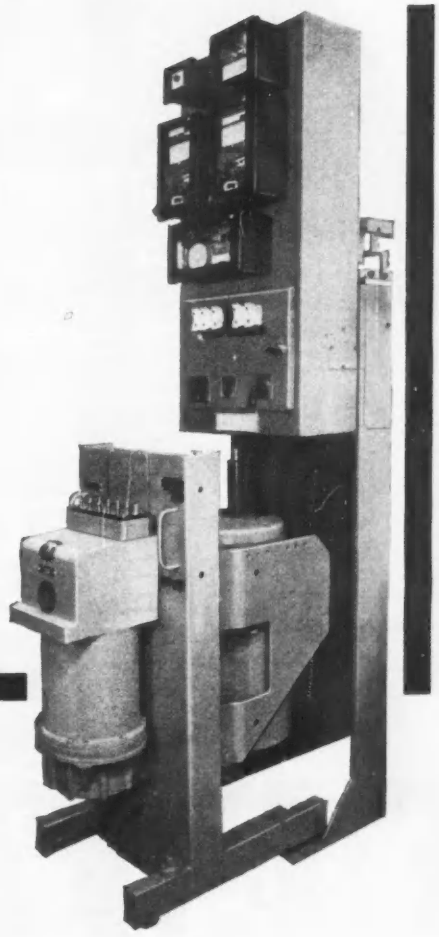

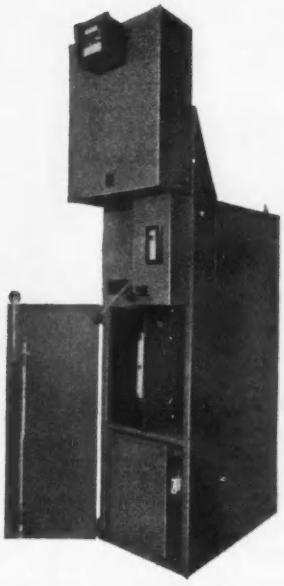

The type AE/VT 6·25 kV single phase fuse-switch unit has been designed to line up with the SD6 oil circuit-breaker units and incorporates a 3-position single phase oil switch. The fuse-switch is capable of breaking the full load and magnetising currents of the auxiliary transformers.

A 6·25 kV single phase, air insulated, metal enclosed unit (Type SD6), which is fully interlocked throughout. The unit has a withdrawable truck mounted circuit-breaker with integral raising and lowering mechanism. This switchgear has been developed for use on the British Transport Commission Railways Electrification Scheme.

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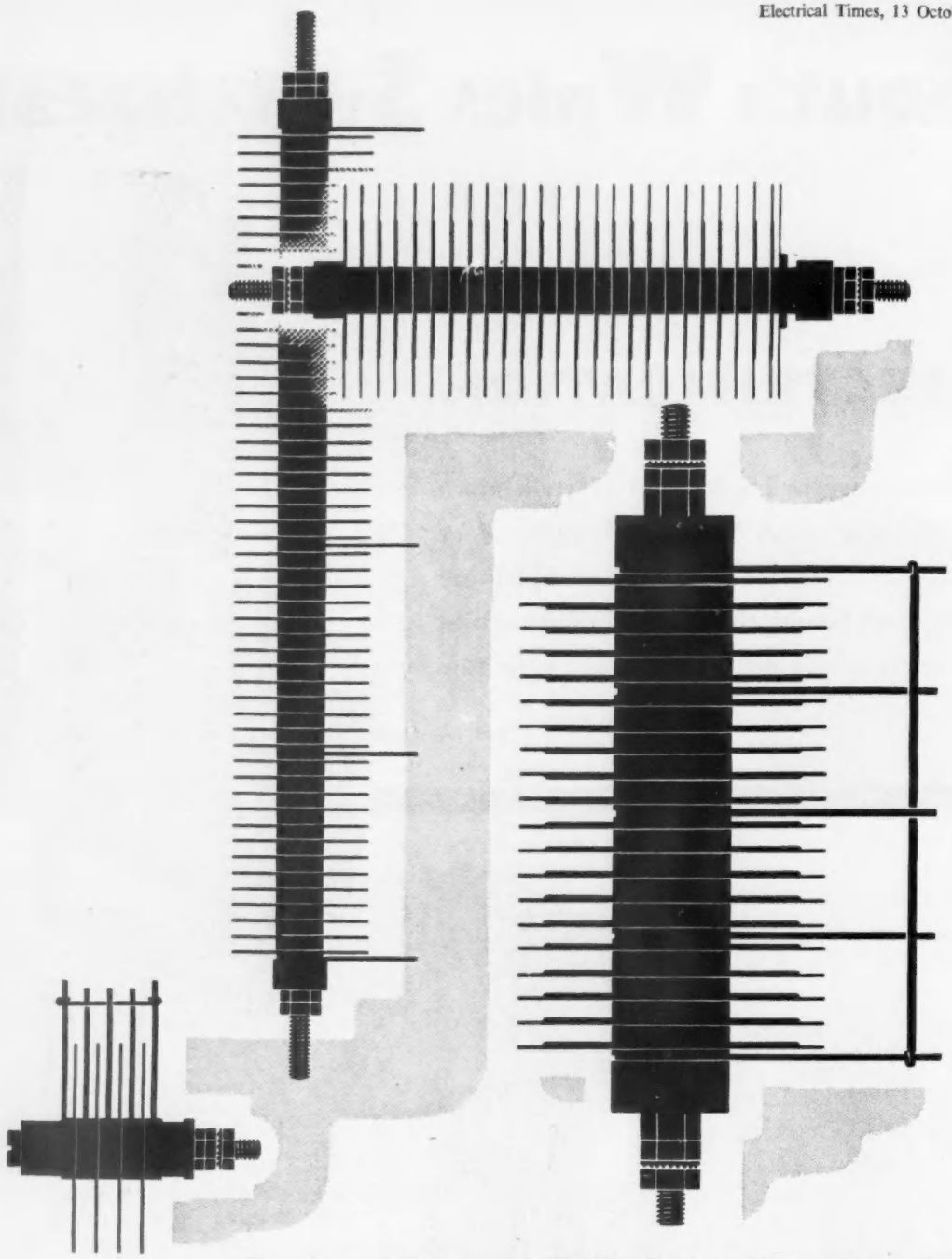

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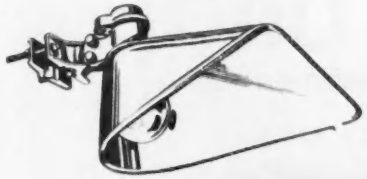
List No. 890
'Realux' Overhead Mounting model, for G.L.S. or M.A./V. lamps.



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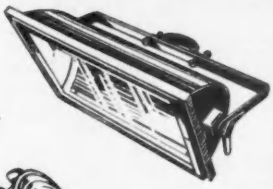
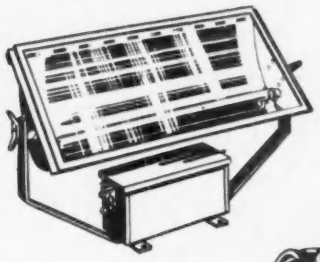
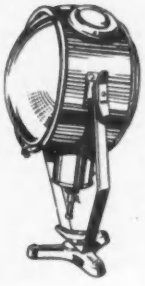


List No. 940
Downward lighting Sodium Lantern for wall or pole mounting.

List No. 775
'Festival' Lanterns for G.L.S. lamps from 100 watt to 1000 watt size.

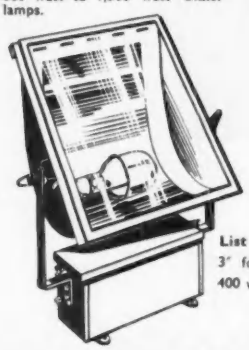
List No. 920
Telescopic Tripod for Floodlantern mounting.





List No. 942
Upward lighting Lantern for 200 watt Sodium lamp.

List No. 568
Narrow beam Projectors for 500 watt to 1,500 watt G.L.S. lamps.



List No. 1231
3° focus Lantern for 400 watt MBF/U lamp.

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For full range see page No. 6
LIST No. 11

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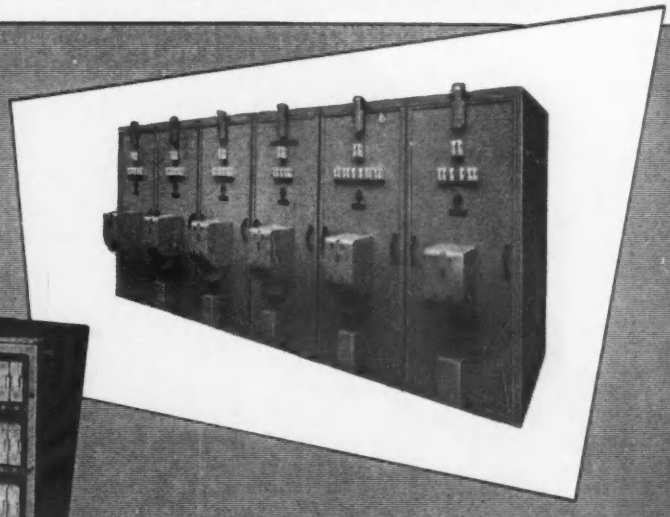

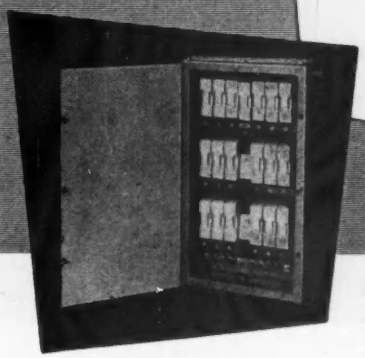

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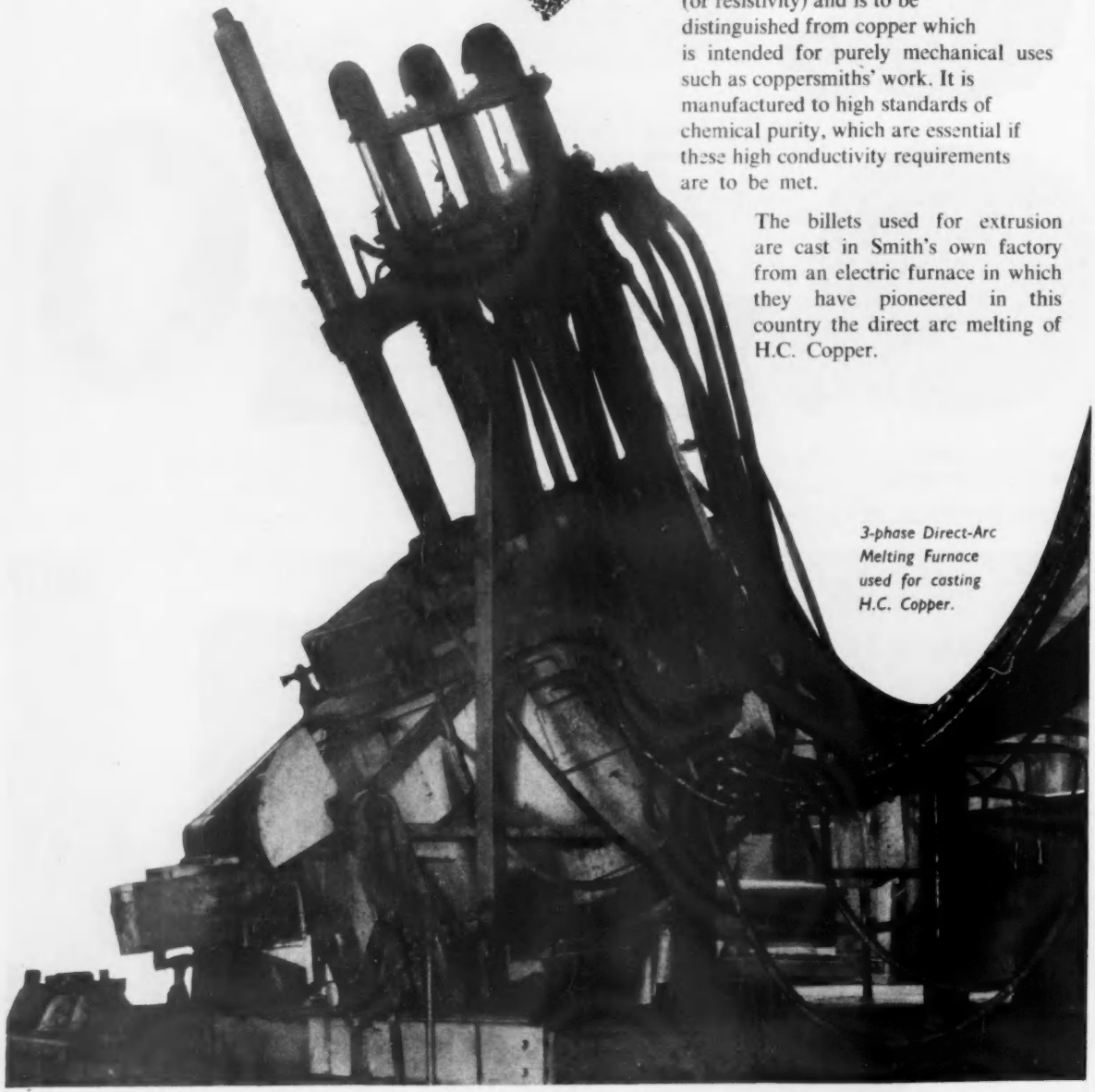

3-phase Direct-Arc Melting Furnace used for casting H.C. Copper.

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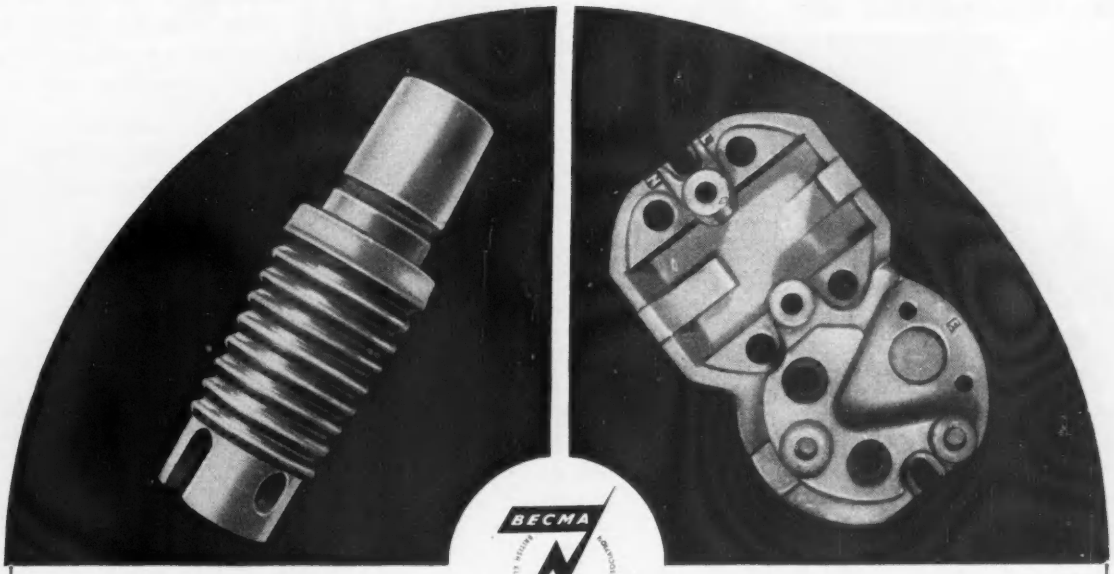

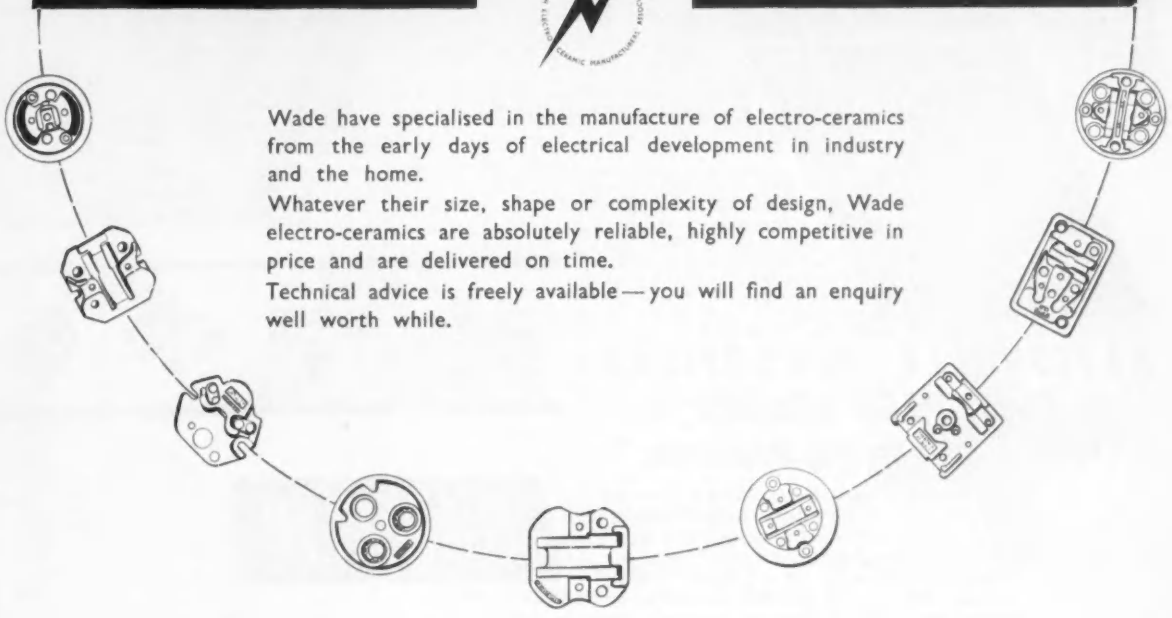

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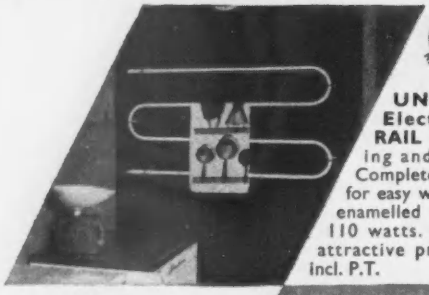

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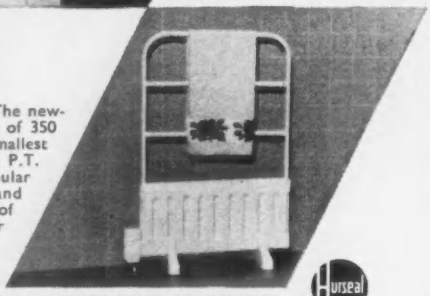

Hurseal HEATS BETTER

RADIANT CONVECTOR A smaller version of the popular and attractive 2 kW convector this new model HEC3 has a loading of 1200 watts, a 2 heat control switch and is priced for quick selling at £9.9.0 incl. P.T.

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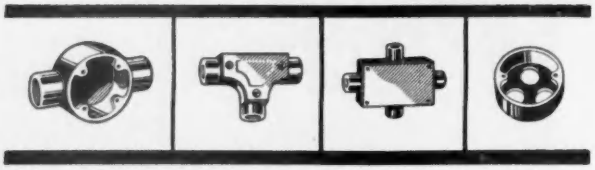

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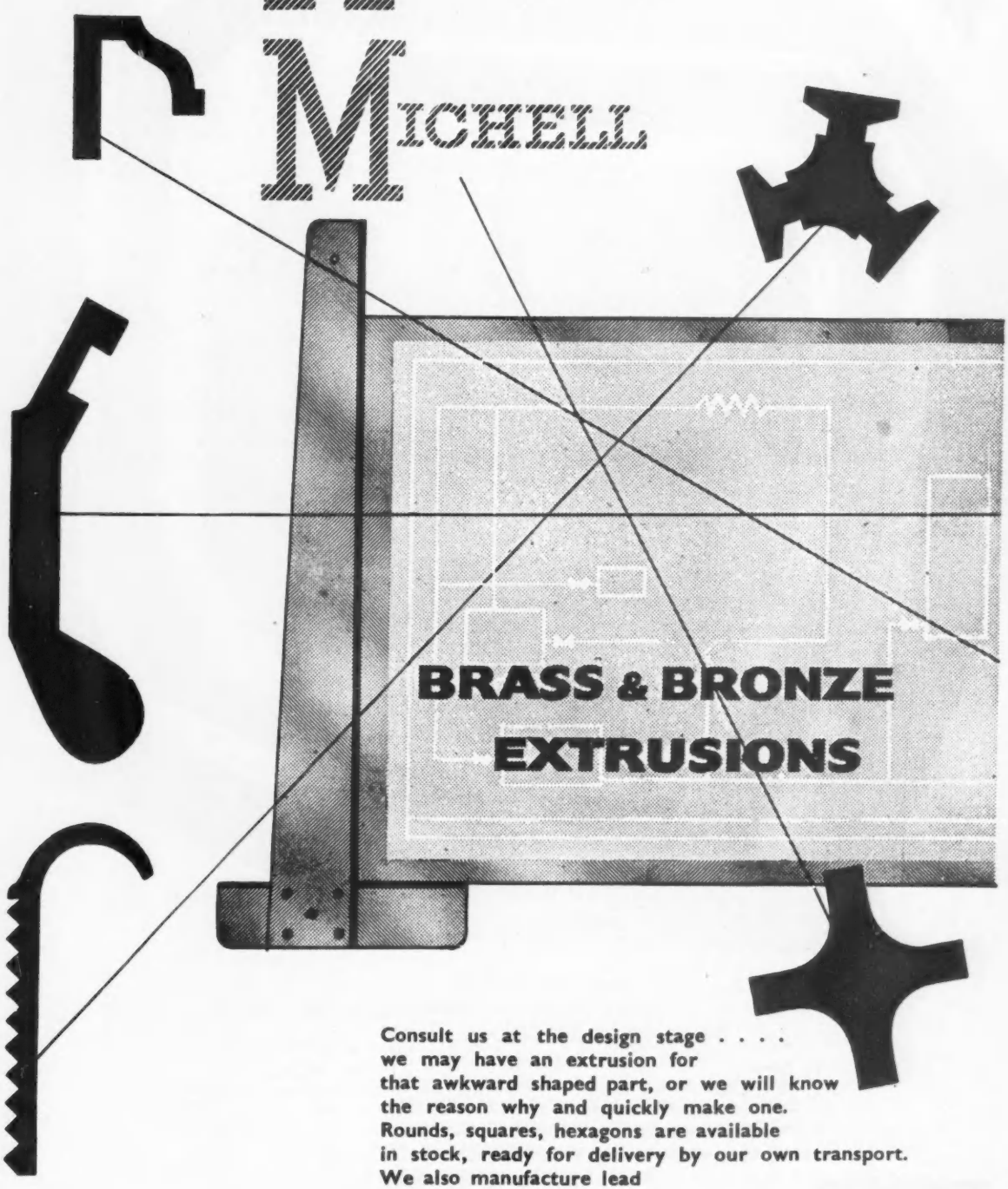

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we may have an extrusion for
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Gravesend's biggest—for Leicester

The largest oil-filled cable ever to be made at AEI's Gravesend Works is this 132 kV 3-core giant, laid under the busy streets of Leicester. 8,000 yards of this cable was installed by the AEI Construction (Cables and Lines) Division for the East Midlands Electricity Board, to reinforce the supply to the northern area of the city.

Some vital statistics: 0.60 sq. in. compacted circular copper conductors; aluminium oil ducts; lead sheathed with tin bronze reinforcement and protected with anti-corrosion serving; overall diameter 4.85 in. Supplied on 11 ft. diameter drums weighing 12 tons each.

AEI

CABLE DIVISION

Associated Electrical Industries Limited

Cable Sales Department

51-53 Hatton Garden, London E.C.1. Phone: CHAncery 6822

NEWS SHEET

Major wage changes for electricians from 1 Jan. Extra 1s/hr for journeymen, revised overtime rates, operative for 2½ years, with cost of living proviso. Agreement follows 42-hour week being introduced 1 Nov. (571)

Floods in Lincs and Devon brought no power breakdown. At Horncastle, cut-outs and meter linkages changed in 150 premises. (573)

Canada imposes 15% duty on British steam turbo-generator imports. Tariff rate to other countries raised 2½% to total of 22½%. (572)

30% of warship cost now attributable to electrical installation, says new IEE president, Sir Hamish MacLaren, in inaugural address. 60 c/s system has weight of advantage over 50 c/s for a.c. distribution. Trend may be to higher voltages and frequencies. (546, 554)

South Scotland EB reduces off-peak tariffs. M.D. charge raised 3s a kW and unit charge now based on coal at 90s a ton. (546, 571)

H.M. The Queen officially opens Kincardine 760 MW station. With a cost of £36¼m. station is one of the major capital developments in Scotland since the war. Three 120 MW sets commissioned, two 200 MW sets under construction. (565)

New electrical retailers' organisation formed, aims at filling need for nation-wide specialist association. First action is to quiz manufacturers on price maintenance practice. (571)

25 MW station operating on 940 ft head on Loch Leven proposed by N. Scotland HEB under £4.2m. scheme for Glen Nevis. Annual output 82m. units expected. (573)

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PEOPLE—J. F. Bird becomes Reyrolle's overseas manager . . . R. M. Gravett promoted to asst. chief commercial officer (industrial) Manweb . . . A. Hunking (Westool) joins board of Warner Brake and Clutch Co. . . . R. D. V. Roberts appointed industrial relations adviser Electricity Council . . . D. R. S. Turner leaves AEI to join Davidson and Co. as director and general manager . . . L. W. Honey joins board of Marryat and Scott Holdings, and L. J. Gooch, Marryat and Place board . . . In London EB changes, R. Thompstone succeeds C. W. Blake (retired) as management officer; G. H. Fowler joins chief engineer's staff; and new district managers are B. L. Wells (West Bourne), R. C. Tuffnell (Central), F. N. Sherborne (Regency). . . . J. Rankin (ex. Manweb) dies. (562, 563)

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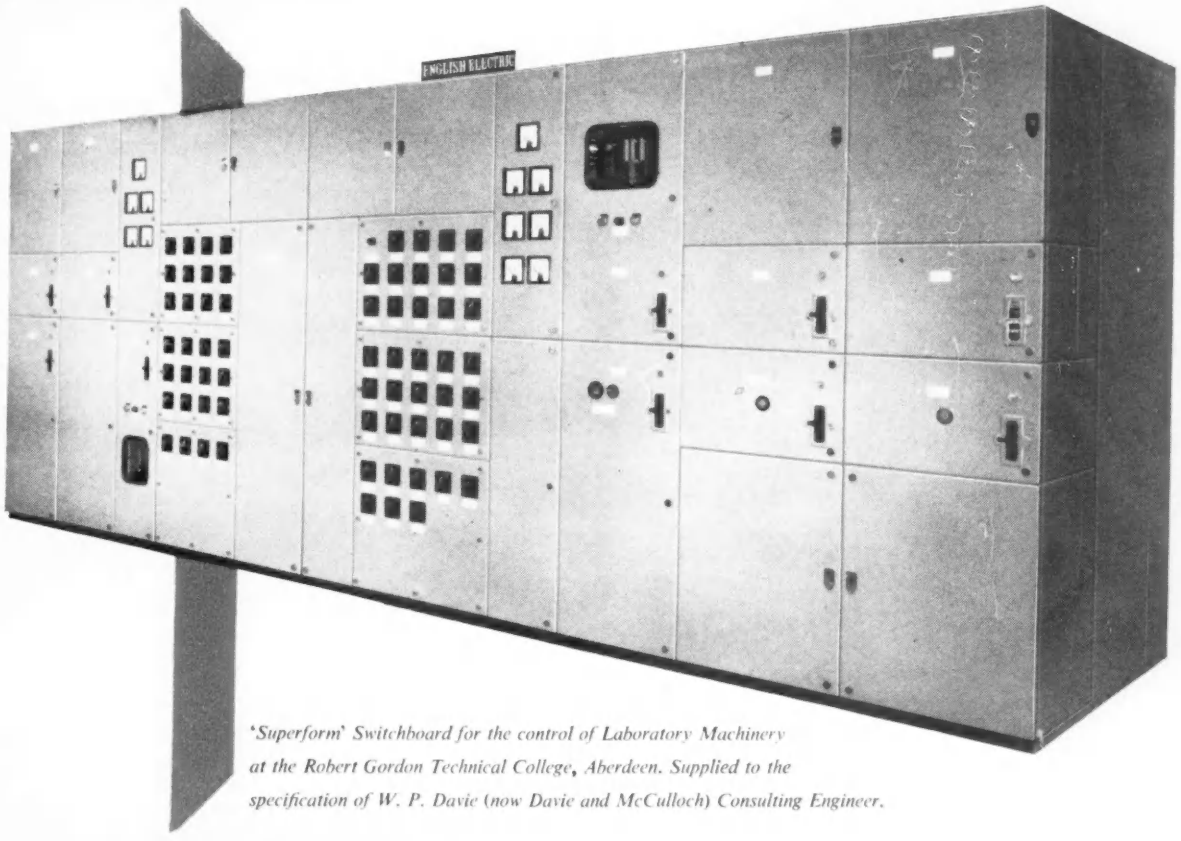

'Superform' Switchboard for the control of Laboratory Machinery at the Robert Gordon Technical College, Aberdeen. Supplied to the specification of W. P. Davie (now Davie and McCulloch) Consulting Engineer.

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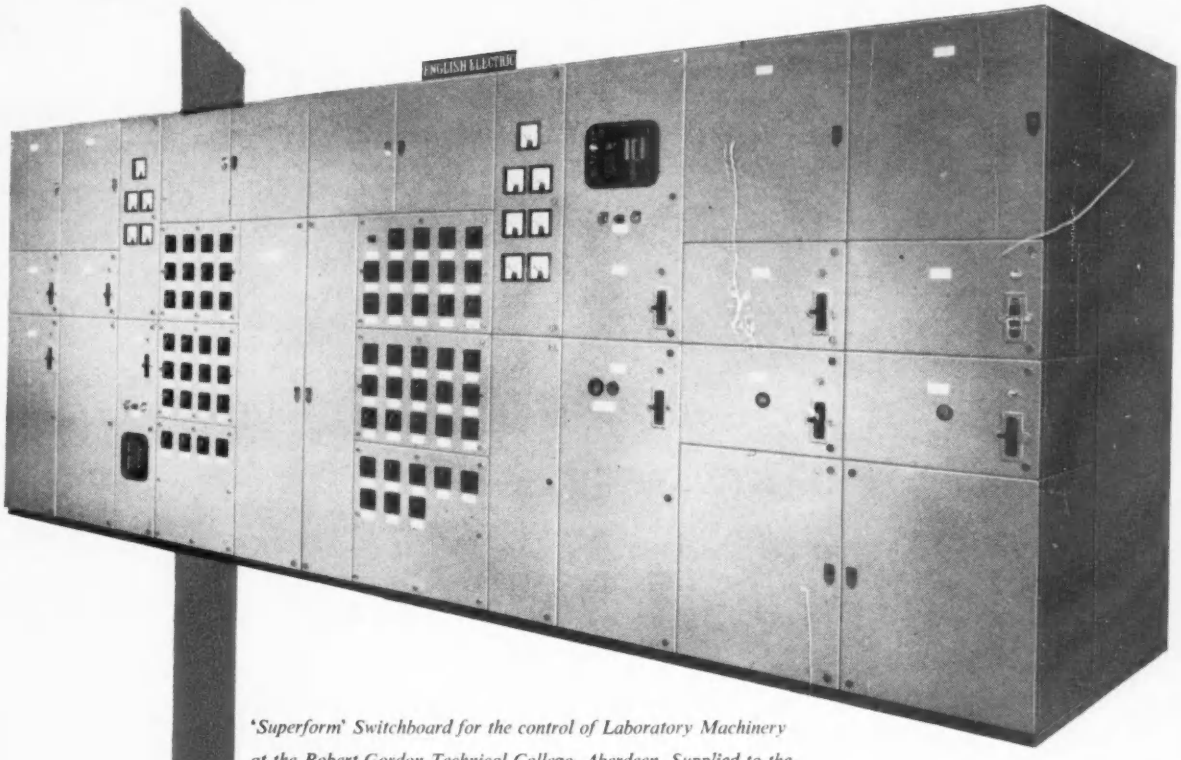

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- Easy access for cabling and maintenance
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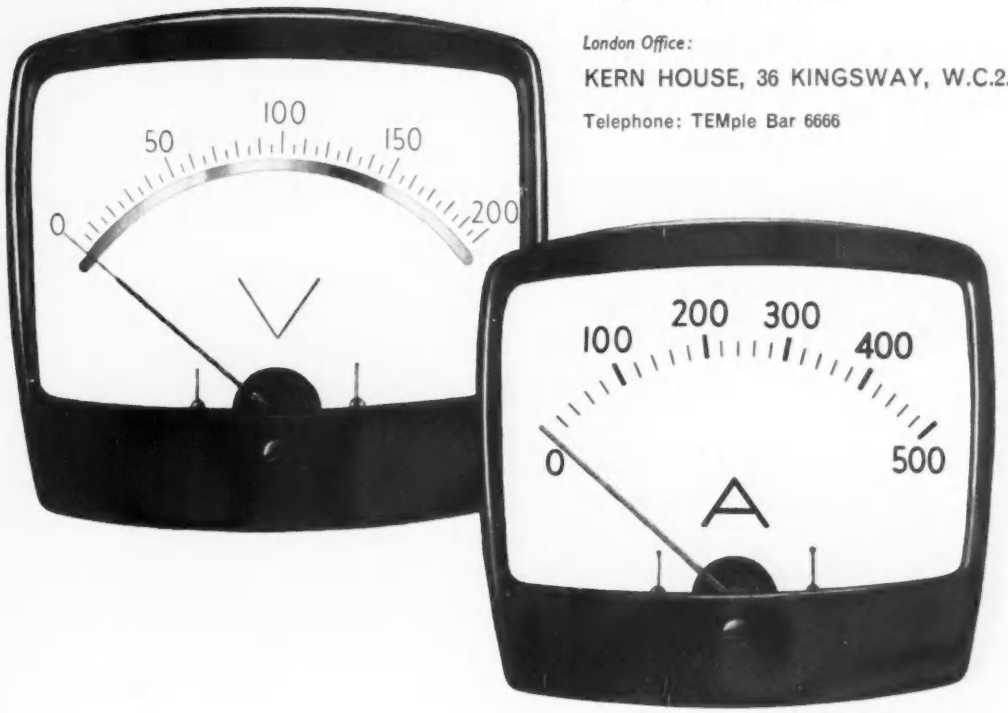

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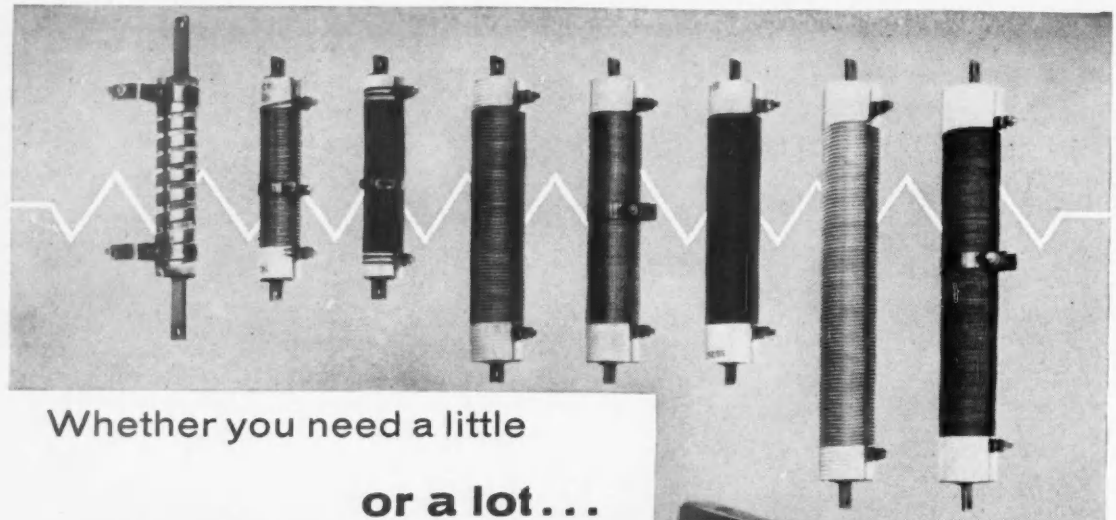

Whether you need a little

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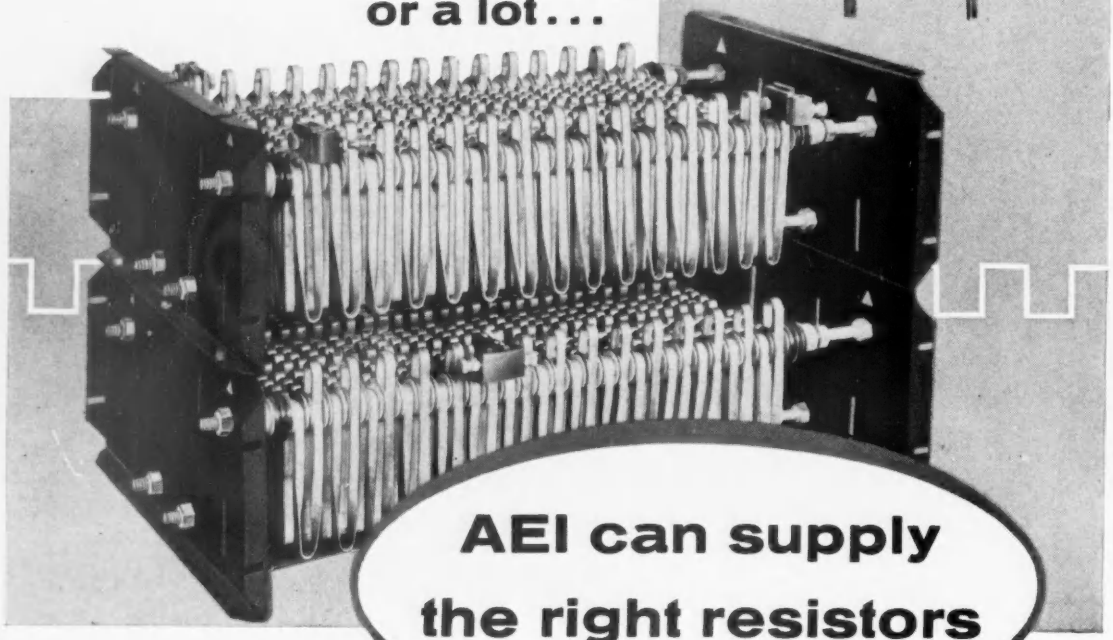

AEI can supply the right resistors

Whether you require a resistor with a rating of a few watts or the most rugged heavy-duty unit, AEI can supply the right resistor for the job. Their range includes general service, severe duty and extra-heavy-current types.

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Associated Electrical Industries Limited
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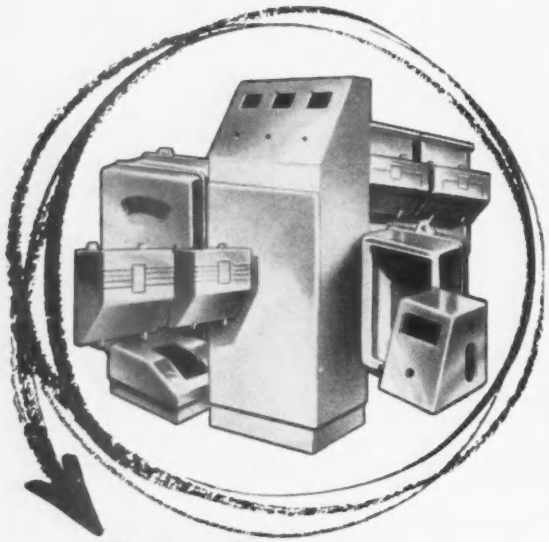

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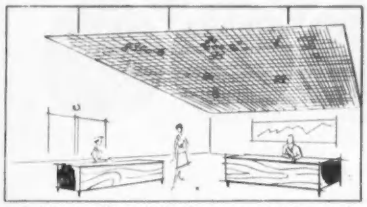
the world's first non-modular suspended ceiling

lightweight sections interlock without visible joints

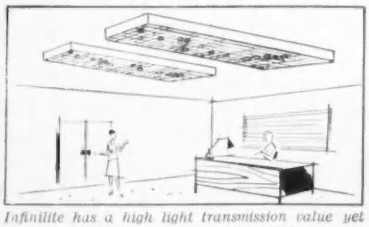
Consider the architectural possibilities of a luminous ceiling material that cuts to any size and shape, that is dimensionally stable, yet so light that it is suspended only by slender wires. This is Infinilite. Its light transmission value is one of the highest of any luminous ceiling material, yet brightness control rings ensure remarkably low surface brightness.

Infinilite comes in standard 24" x 25" interlocking panels that clip together to form ceiling areas of any size.

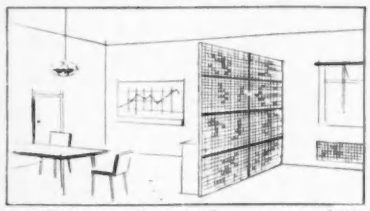
Investigate Infinilite — luminous ceiling — room divider — decorative material — and in imaginative hands much more besides.



Infinilite weighs so little, it is suspended by slender wires only. No T beams.



Infinilite has a high light transmission value yet surface brightness is exceptionally low.



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the revolutionary new suspended **ceiling**

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make merry with a
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10 TIMES BETTER OFF WITH CLASS H MOTORS

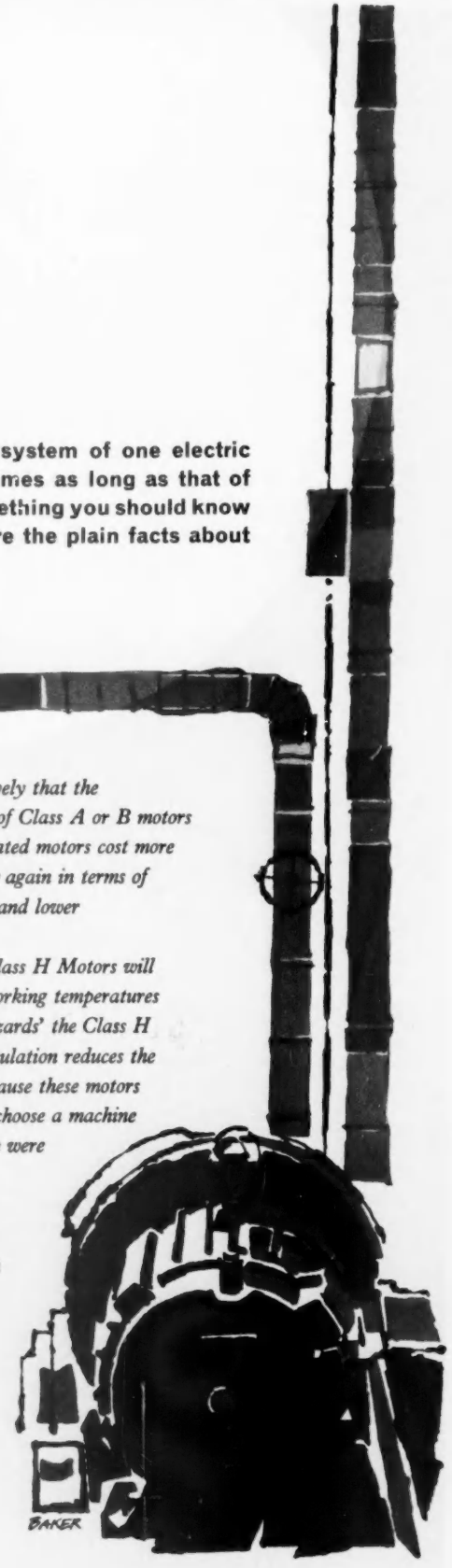
If the insulation system of one electric motor lasts ten times as long as that of another—it's something you should know about! So here are the plain facts about Class H Motors.

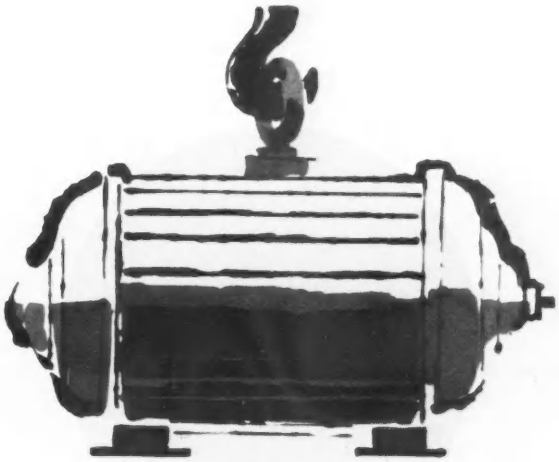
***Continuous** running tests have proved conclusively that the insulation life of Class H machines outlasts that of Class A or B motors by* more than ten times. *Although silicone-insulated motors cost more initially, the extra outlay is repaid time and time again in terms of lower replacement costs, lower maintenance costs and lower production losses due to breakdown.*

***No** matter how testing the working conditions, Class H Motors will take the strain. High humidity levels . . . high working temperatures . . . heavy overloads. All these 'occupational hazards' the Class H Motor can take in its stride since MS silicone insulation reduces the risk of breakdown to the very minimum. And because these motors are so resistant to overload, it's often possible to choose a machine of lower capacity than if a Class A or B machine were being used. Result—still further economies.*

***So** don't imagine that the Class H Motor is in the 'luxury' class . . . something to be specified only in exceptional conditions. On the contrary, a silicone-insulated motor is today's first choice—no matter what the circumstances!*

MS





REMEMBER SILICONES FOR REWINDS TOO

The value of silicone insulation is by no means restricted to new machines. Many a troublesome Class A or B motor—given to repeated breakdowns—has been totally transformed by a timely silicone rewind.

At the Latchford Locks Works of the British Aluminium Co. Ltd. a centrifuge, used for cleaning aluminium swarf, is powered by a 15 HP motor which is mounted beneath the centrifuge. To help in the cleaning, live steam at about 10 psi is admitted to the centrifuge while it is in motion. The motor, when new in 1954, was wound with Class A insulation, but failed after eight months due to condensation on the windings. Rewound with Class A it failed again—this time after only two weeks' service. To prevent repetition of these failures the motor was then rewound using silicone insulation, and in fact ever since it was recommissioned in May 1955, British Aluminium report, 'the centrifuge has been used almost constantly without further trouble with the motor windings'. They go on to say, 'There is no doubt that the employment of silicone insulation has greatly lengthened the trouble-free working of the winding of this motor.'

***Amongst** the leading manufacturers of Class H motors are: Associated Electrical Industries (Rugby) Ltd · The English Electric Co Ltd · The General Electric Co Ltd · Bruce Peebles & Co Ltd · Woods of Colchester Ltd · Brook Motors Ltd · Lancashire Dynamo & Crypto Co Ltd · Brush Electrical Engineering Co Ltd · Howells Electric Motors Ltd · Laurence, Scott and Electromotors Ltd.*

For a list of names of the many rewinders experienced in the use of silicone insulation, contact your nearest Midland Silicones branch office.

All over Britain, MS silicones are strengthening the weak link in electrical equipment—its insulation. Midland Silicones Ltd manufacture a full range of silicone products for use in the electrical industry. And Midland Silicones Ltd consistently set the pace for progress in this fast-developing field.

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MSE 4

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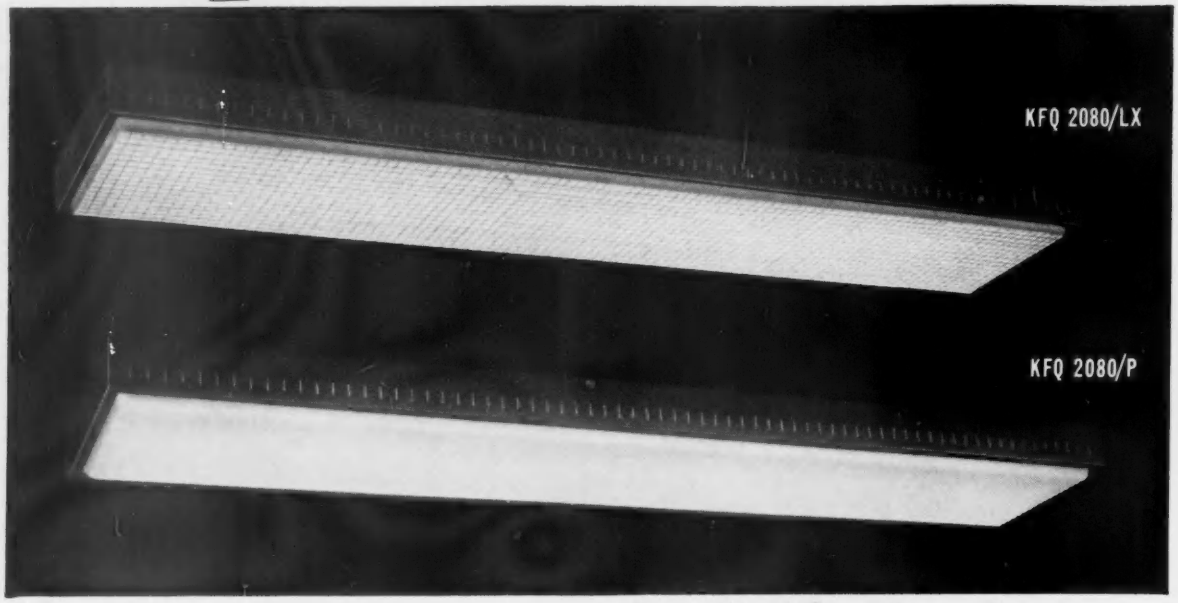

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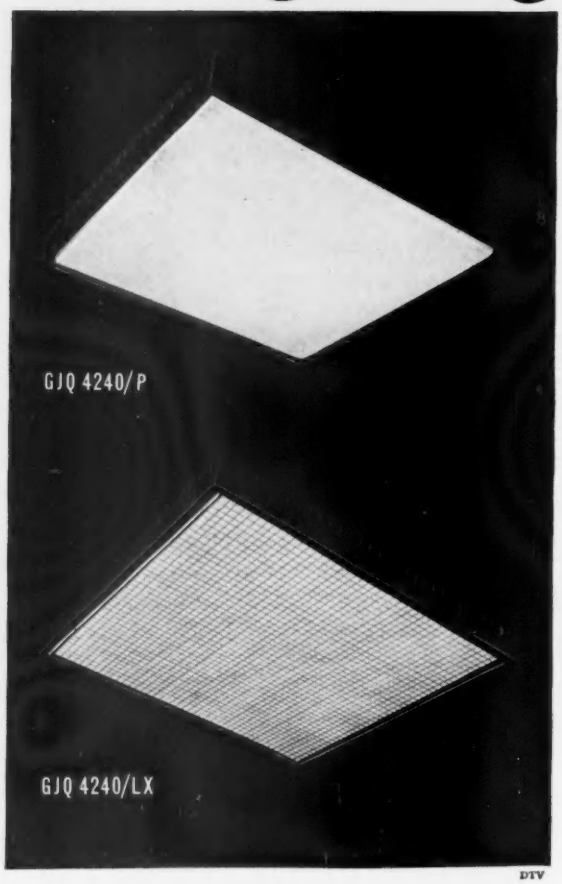

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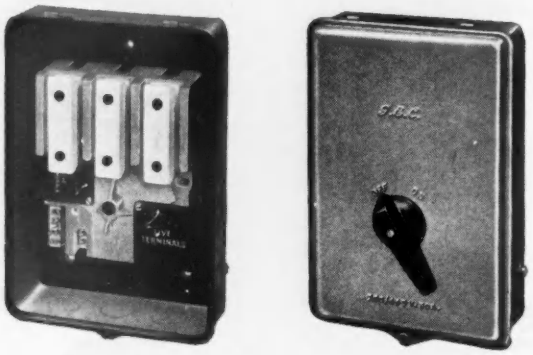

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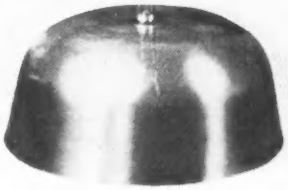

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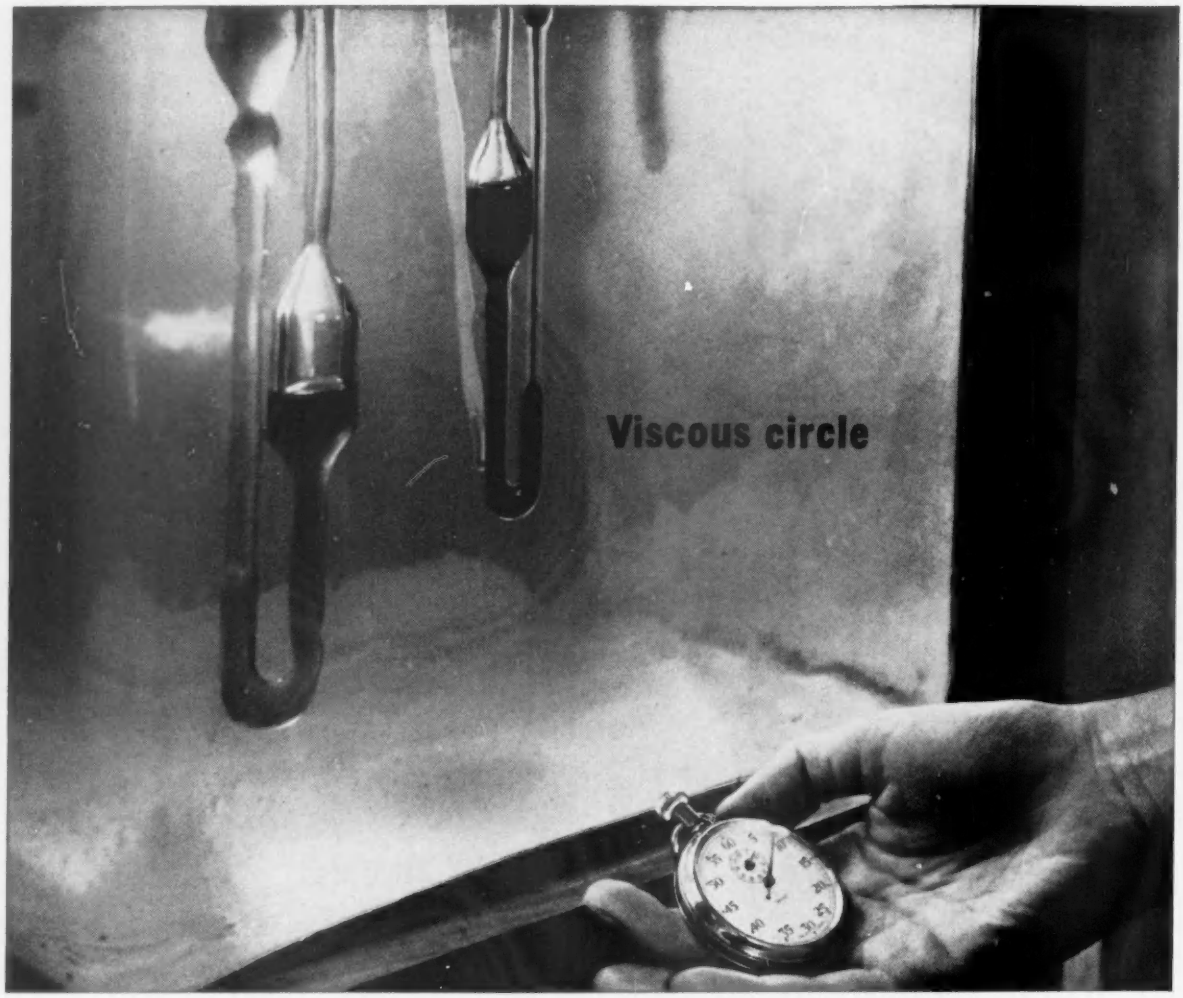

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THURSDAY 13 OCTOBER, 1960
Registered as a Newspaper Volume 138 No. 15

Dans ce numéro

Laminoire reversible pour aluminium 547

Lingots d'aluminium jusqu'à une épaisseur de 41 cm. et une longueur de 380 cm. peuvent être laminés dans un laminoire à chaud reversible de nouvelle construction. Ce laminoire est commandé par deux moteurs de 4.000 h.p. chacun à courant continu derivé d'un groupe Ilgner. Les moteurs sont disposés de façon que le supérieur est plus près au laminoire pour permettre l'accès également facile des deux moteurs. Les moteurs principaux, le groupe Ilgner et les autres commandes and contrôles sont placés dans la chambre des moteurs adjointe au laminoire.

Moteurs électriques pour les Chemins de Fer Britanniques 556

Locomotives électriques et materiel roulant a unité multiple ont été le sujet de discussions à une conférence internationale. Les locomotives du systéme 25/6.25 kV à 50 Hz sont fournies d'un moteur à courant continu muni d'unités transformateur/redresseur et sont destinées à atteindre une vitesse de 160 km. par heure avec un charge trainé de 475 tonnes sur chemin horizontal. Unités multiples pour le service de banlieue sont destinées à atteindre une vitesse de 120 Km. par heure avec une acceleration moyene au départ de 1,76 Km/h par seconde.

Centrale Ecoissaise de 760 MW 565

La Centrale de Kincardine est située sur le Firth of Forth dans l'Ecosse meridionale. La première phase comprends trois turbo-alternateurs alimentés à vapeur à chaudière individuelle pour 390 tonnes par heure. Les caractéristiques de la vapeur prises à la soupape d'arrêt de la turbine sont 105 Kg/cm2 à 538°C. avec un rechauffement jusqu'à 538°C après passage à travers le cylindre de haute pression. On a déjà commencé l'addition de deux groupes de 200 MW chacun à cette centrale.

In dieser Nummer

Aluminium-Umkehrwalzwerk 547

Auf einem vor Kurzem in Dienst gestellten Umkehr Heisswalzwerk können Aluminiumbarren bis zu 410 mm stark und 3800 mm lang ausgewalzt werden. Der Antrieb erfolgt durch zwei nach dem Ilgner-System gespeisten Gleichstrommotoren von je 4000 PS, die so angeordnet sind, dass der höher gelegene Motor der Walzstrasse am nächsten liegt. Hierdurch wird erreicht, dass beide Motore gleich gut zugänglich sind. Die Antriebsmotore, der Ilgner-Satz und sämtliche übrigen Antriebs- und Steuerungsorgane sind in einem neben der Walzhalle gelegenen Betriebsraum untergebracht.

Elektromotore für die britischen Eisenbahnen ... 556

Auf einer internationalen Konferenz standen elektrische Lokomotive und Triebwagenzüge zur Diskussion. Die für das britische 25/6,25 kV, 50 Per.-Netz vorgesehenen Lokomotiven haben durch Umformer gespeiste Gleichstrommotoren und sind für eine Höchstfahrgeschwindigkeit von 160 km/St bei einer Zuglast von 475 Tonnen auf ebener Strecke ausgelegt. Für den Vorortеverkehr bestimmte Triebwagenzüge sind für eine Höchstfahrgeschwindigkeit von 120 km/St und eine mittlere Anfahrbeschleunigung von 1,76 km/St/sek konstruiert.

760 MW-Kraftwerk in Schottland 565

Das neue Kincardine-Kraftwerk liegt an der Forth-Einbuchtung im südlichen Teil Schottlands. Die erste Entwicklungsstufe umfasst drei 120 MW-Turbogeneratorsätze, deren Dampfverbrauch Einheitskessels mit einer Nennleistung von 390 t/h entnommen wird. Dampfwerte am Turbinenabsperrventil: 105 kg/cm², 538° C mit Wiedererhitzung auf 538° C nach der Hochdruckstufe. Der Einbau zweier weiterer 200 MW-Generatorsätze wurde bereits in Angriff genommen.

ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

Hot Reversing Mill for Aluminium 547
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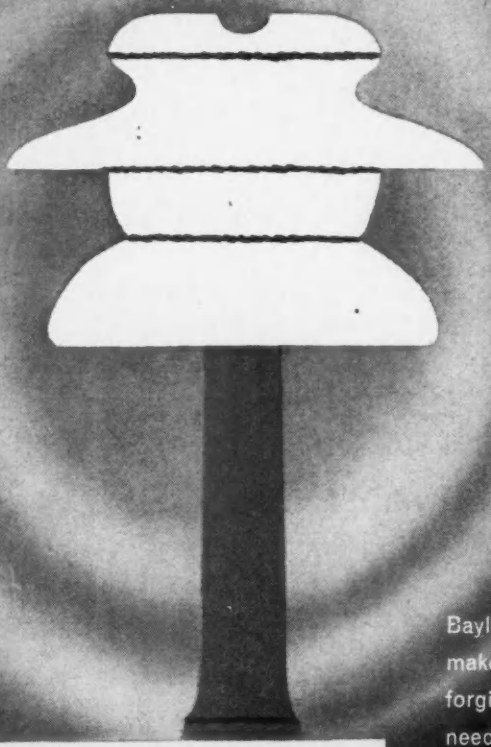
BJB CARRY POWER ACROSS THE WORLD



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ELECTRICAL
TIMES

ESTABLISHED 1891

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Editor and Managing Director:
ROY BALDWIN, M.I.E.E., Barrister-at-Law

Joint Editor:
K. C. POUNDS, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E.

News Editor:
T. W. WRIGHT

Comment

FINANCE FOR SUPPLY

There is a welcome confidence and pride in the strength of the supply industry in an important review of the industry's financing practice which Dr R. S. Edwards, one of the Electricity Council deputy chairmen, has contributed to *Lloyds Bank Review*. He expresses a fear that his article may be read as either defensive or complacent, but there is little defensive in his claim that: "If the electricity industry was told to fend for itself and given freedom to choose how best to do this it could make a good showing on the capital market. . . . In the financial framework within which it is asked to live it pays its way. It could do so in any other." Nor is there complacency in his discussion of tariff design as a means to an improved load factor, where he shows concern that enthusiasm for lower unit charges could lead to the position where increasing volume of business resulted in lower rather than higher surpluses because charges fall below marginal costs. This survey is going to be quoted as an important inside opinion on the case for present practice in the industry; practice which is conveniently considered as applying overall, but which must in the last resort be related, as Dr Edwards is careful to emphasise, to the individual responsibility of each board separately for its financial results. Inevitably, it is in large part a repetition of the financial section of the recently published Electricity Council report, but the additions are significant. Outstanding amongst them is an indirect contrasting of the abilities of the area boards and of the Generating Board to meet unexpected demands. For the Generating Board, as we pointed out last week, the older plant on the system provides a margin either way. It could be kept in being to meet occasional peaks if there was underestimate, or taken out of service without serious financial consequences if demand fell below long-term expectations. But the distribution networks have been starved of capital too long. They have no "fat" to eat up when underestimate occurs. Fast injection of capital is their only hope of survival, a situation which seems only recently to have been admitted at Government level.

PAYING FOR THE FARMER

There is welcome imagination and enterprise in the Eastern EB announcement last week-end that they are to embark on a planned scheme to complete rural electrification in the area over the next five years. Some 5,000 farms and nearly five times that number of other rural premises are involved, inevitably the most remote in an area which has the second highest number of farms of all the area

boards. To connect them with reasonable economy will need careful planning and large-scale operation of line gangs; it will need as well the co-operation of the populace, individually and through local authorities, so that the growing delay over wayleaves and planning permission, respectively, can be kept to manageable proportions. Yet even if all this is obtained, and the vigour of the Eastern Board approach promises well on that point, "Operation Round-Up" will only go through by courtesy of existing EEB consumers. This is because the Board intends to keep connection charges unaltered, although they are based on calculations in relation to more accessible premises. Such charges cannot cover the economic cost of the new schemes, however onerous the potential consumers may find them. Of course, the Board is well within its rights in its decision. It has to "secure so far as practicable" extension of supplies to rural areas, just as it has to "secure so far as practicable" cheapening of supplies generally, and ensure that its revenue account is not in deficit. The Eastern EB have decided that its inlying consumers shall help those more remote. A question which must arise is how this policy will affect the hope of some other boards to persuade central government that any such subsidy should be its responsibility, not that of the supply industry.

ELECTRIC BLANKET ACCIDENTS

Consumers Association Ltd., in their publication *Which?*, this month tackle the question of electric blankets, not from the aspects of value for money or operating efficiency, but from the safety angle. Electric blankets are a great comfort, but their safety record has not been so good as that of most electrical devices. It has been improving—the 2,600 fires in 1956 quoted by *Which?* is probably reduced to about a quarter now, despite many more blankets in use—but there are more accidents, including fatalities, than can be regarded with equanimity. *Which?* puts emphasis on loading and thermostatic control in its discussion of blanket safety, but it may be that although neglect of such factors leads to burns it is other causes that are more responsible for serious trouble. For example, one leading authority has suggested that open-circuit arcing is the main cause of fires originating in electric blankets. That underlines one of the alarming characteristics of electric blankets; it is easy to make a blanket of some sort at a low price, probably expensive to ensure that the blanket that looks the same and heats the same remains safe under the stress of constant use.

TARIFF ACROSS THE BORDER

With electricity tariffs at the moment so much in the mind of area boards, it is worth while giving close attention to what is happening across the border. The South of Scotland EB, which had an origin common with that of other area boards, now has the distinction of looking after its own generation and freedom from the mutual influence of Sir Robertson's round table. Such independence has obviously played a part in the second round of tariff changes that the Board are now making following the 6% rise in domestic and commercial tariffs earlier this year. The particular success that they have had in off-peak load development has whetted their appetite for more. With about one-fifth of the off-peak load of Great Britain within their area, they are now cutting tariffs by 0·04/0·05d a unit, while retaining the favourable basis of restricted periods. Of greater effect is the rise of three shillings a kW m.d. for industry, reflecting the higher capital charges of modern plant, a factor to which the CEGB has already given tariff-wise expression. There is also some corresponding reduction in the unit charge. The distinguishing feature of this new tariff lies in the coal adjustment clause. This is now based on a cost of 90s a ton instead of the familiar 60s so that, with average coal cost below this figure, the consumer will be given a rebate on a higher-priced unit instead of the usual surcharge on a lower-priced one. The psychological niceties of the two charging methods will no doubt lead to endless discussion between tariff specialists, particularly as the South Scotland adjustment is 0·00004d (0·00002d h.v.) lower than most tariffs south of the border, possibly due to the higher component of hydro-electricity purchased and generated.

WHY THE NAVY WENT A.C.

Electrical equipment accounts for almost one-third of the cost of new ships for the Royal Navy. That startling estimate by the incoming president of the IEE, Sir Hamish MacLaren, indicates the importance of the tale he tells in his presidential address of electricity's rise afloat. A crucial decision that stands out is the choice of alternating current for post-war construction; and the selection of the American 60 c/s standard for frequency. At this late time, Sir Hamish's rehearsal of the arguments for this choice remains of interest. Increasing power demands made a higher voltage necessary and the higher voltage was a strong indication for a change to a.c. despite real and imagined difficulties about variable speed drives. Close behind electrical necessity came general weight considerations, and here the distribution economy of a multi-phase system had added attraction. But what frequency? From the weight aspect, the highest possible; 60 c/s was the final choice, ostensibly because it gave something in weight advantage while at the same time keeping within the well established design range. Of course, it also gave compatibility with the US Navy, though Sir Hamish suggests that as an incidental factor. That choice, however, has proved decisive for the merchant navy as well, and some of the consequential RN decisions, such as the choice of a high standard of automatic voltage regulation at generators rather than use of voltage stabilisation gear in equipment have also been instituted.

Meteor

This week's quick summary of electrical news faces advertisement page 16

Hot reversing mill for aluminium—part 1

by G. H. Sutton*

THE plant installed at the Rogerstone Works of Alcan Industries Ltd., formerly Northern Aluminium Co. Ltd., in 1950 for the production of aluminium sheets appeared in 1956 to be approaching the production limits, both for size of product and for quantity of production. The layout of this hot mill line is shown in Fig. 2. Use of large aluminium plates for ship superstructures had increased and showed every prospect of further expansion. Alcan Industries, therefore, decided that the capacity of the hot strip line should be increased and a breaking-down stand installed which would be capable of rolling large plates from ingots of up to 16 in. thick, 150 in. long and weighing 17,500 lb.

In July, 1957, AEI were authorised to proceed with the design work and later with manufacture. The developments which were finally decided upon were as follows:

1. A four-high hot roughing reversing mill would be installed in front of the existing hot line and used for the initial breaking down before the slabs are conveyed into the existing breaking-down stand (96 in. mill). The 144 in. hot reversing mill was to be of sufficient width and power to enable it to function as a plate mill independently of the hot line.

2. The existing breaking-down stand (96 in. mill) would become the intermediate stand and the existing intermediate stand (84 in. mill) would be removed and replaced by transfer tables.

The existing finishing mill comprising two four-high stands in tandem would be increased to three stands with provision for the later installation of a fourth stand. Initially, there would be a single hot coiler synchronised with the final finishing stand. Provision was to be made for installing a second coiler at a later stage. The new arrangement of the hot line is shown in Fig. 3.

Hot Reversing Mill

The electrical equipment supplied for the 144 in. hot reversing mill was designed to drive and control all operations on the ingot from leaving the ingot heating furnace, through the rolling schedules, until it is cut to

* Mr Sutton is with Heavy Plant Division, Associated Electrical Industries.

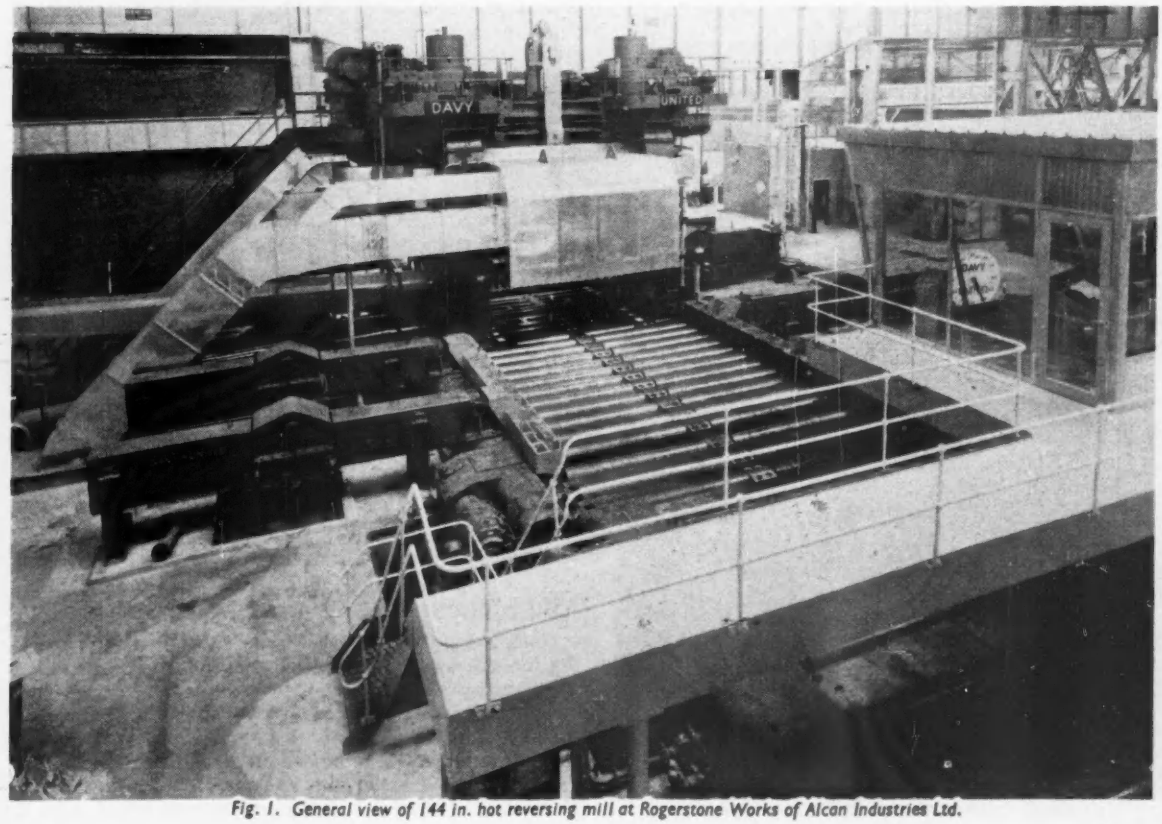


Fig. 1. General view of 144 in. hot reversing mill at Rogerstone Works of Alcan Industries Ltd.

Fig. 2. Layout of hot mill line installed in 1950

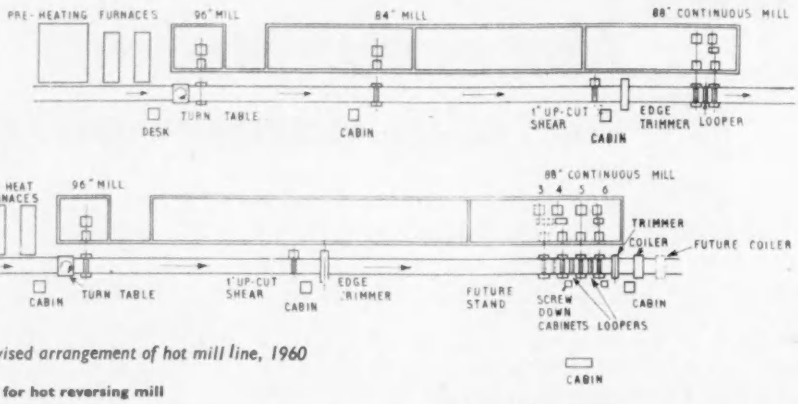


Fig. 3. Revised arrangement of hot mill line, 1960

Table I. Main drives for hot reversing mill

Drive		Continuous Rating h.p. or kW.	Peak Rating h.p. or kW.	Cut-out Rating h.p. or kW.	R.P.M.	Volts
Mill motors (twin drive) ...	2	4,000	10,000	12,000	30/60	950
Ilgner set: induction motor ...	1	8,000	16,000	18,400	750	11,000
flywheel	1	200,000 h.p. seconds				
generators	4	1,600	4,000	4,800	750	475
Main exciter set synch. motor ...	1	1,000	0·5 leading p.f.		1,000	11,000
Slab shear motors	2	400	1,000	1,200	650	400
Slab shear set synch. motor ...	1	1,000	0·5 leading p.f.		1,000	11,000
Screwdown motors	2	200/400			0/420/840	0/230/460
Table motors	11	75/150			0/515/1030	0/230/460

the required length in the slab shear. It is then either passed on to the 96 in. mill for further rolling and coiling or is removed as a completed plate.

The main drives are listed in Table 1, above.

Layout

The space available for the electrical equipment was limited but it was possible to place the motor room between the 96 in. mill pre-heat furnaces and new pit-type pre-heat furnaces. This arrangement was also convenient because a single additional bay could be built to house the mill, roll grinding shop and motor room served by a common 125 ton/25 ton crane. The crane passes through an opening fitted with roller shutter doors between the motor room and the mill.

The position of the motor room has made it much squarer than usual. The layout is shown in Fig. 5.

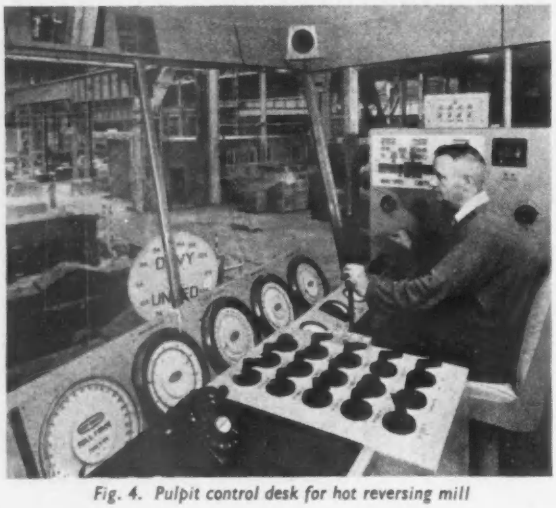


Fig. 4. Pulpit control desk for hot reversing mill

By placing the Ilgner set parallel to and adjacent to the mill motors, the aluminium busbar runs are reduced to a minimum. The lubrication room is at the non-drive end of the mill motors, where it is in a convenient position to obtain adequate fall from all bearings. This layout has the advantage that the busbars and the oil pipes do not cross, since the oil pipes are taken from the outer sides of both blocks. A heavy erection area with a strengthened floor is provided over the lubrication room, capable of taking the weight of a motor armature and two frames (about 220 tons). The two main auxiliary motor generator sets are placed between the Ilgner set and the mill motors, as they stand on a suspended floor of the motor room and do not require any foundations extending into the basement.

On the opposite side of the Ilgner set from the mill motors are the convertors for supplying the table motors. These consist of six pumpless steel tank truck-mounted convertor units with two grid control cubicles.

Adjacent to the convertors are the dynamic braking switches for the Ilgner set motor.

All control gear is mounted in an annexe (Fig. 8) which is sound-proofed and separated from the motor room by double glazed screens. A total of 176 ft of open control panel is provided. The d.c. control panels are mounted on the ground floor while the a.c. control panels and distribution switchgear are mounted immediately above on a gallery. The supervisory desk is set against one of the glazed screens so that the operator looks out onto the motor room and has his back to the control panels.

In between the control panels and the supervisory desk are the magnestat cubicles housing the magnestats (magnetic amplifiers) and amplifiers for: feed rolls; turn-tables; load balance; screwdowns; slab shear. Also housed here are phase shifting auxiliaries and reversing switch static switching for the table drives.

The alarm annunciation equipment is mounted beside the magnestats.

Mill Motors

Until recently, large twin drives have been built with the top roll motor further from the mill than the other, a jackshaft passing over the bottom roll motor to a bearing on a bridge or "A" frame which spans the drive-end bearing of the bottom motor. With this arrangement access to the bottom roll motor is difficult and for any major inspection the jackshaft must be removed before the motor frame can be lifted.

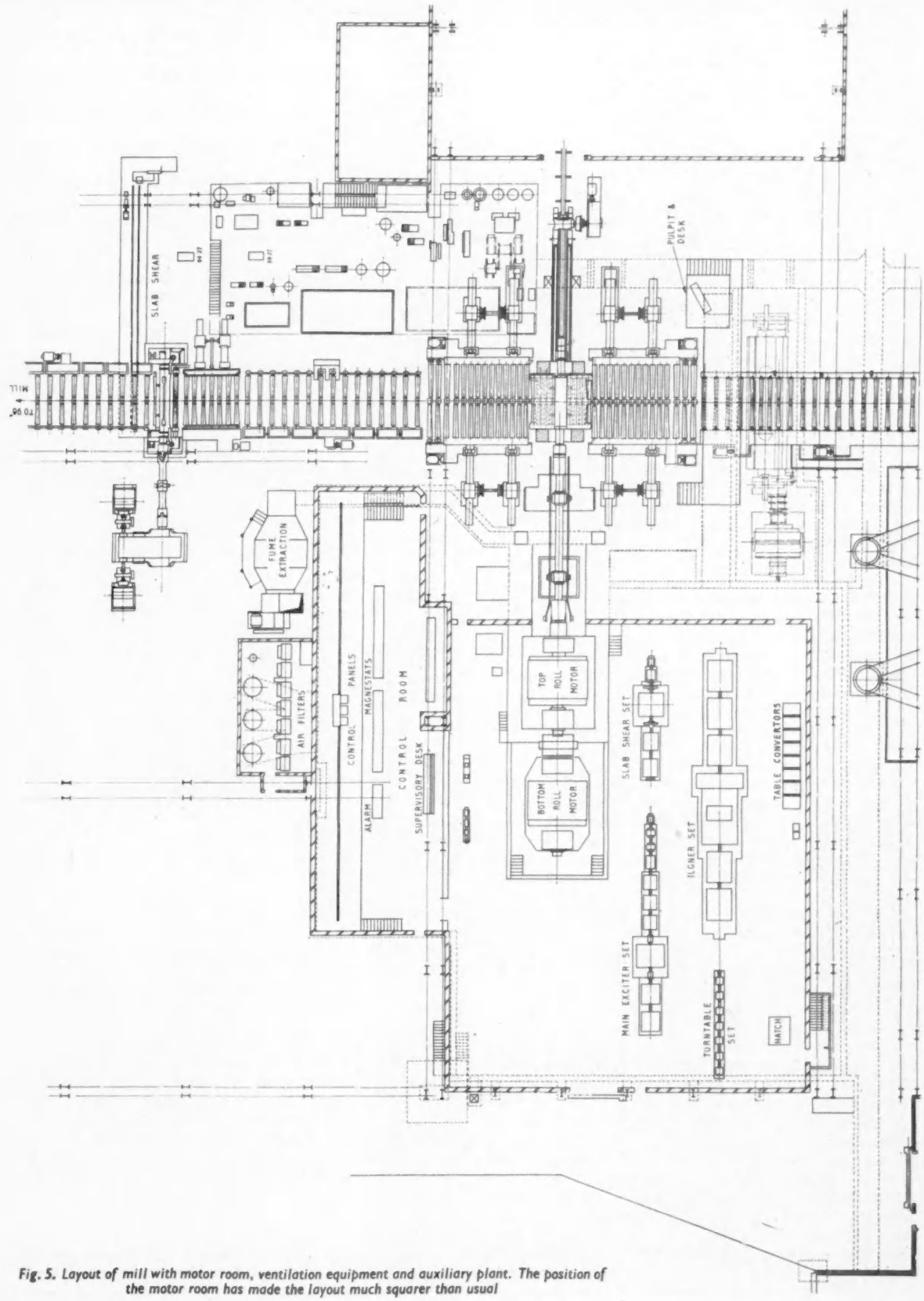


Fig. 5. Layout of mill with motor room, ventilation equipment and auxiliary plant. The position of the motor room has made the layout much squarer than usual

In order to provide equally good access to both motors, twin drives may be arranged with the top motor nearer the mill and the bottom roll drive passing underneath it, so that the jackshaft, which needs no maintenance and is never likely to need replacement, is out of sight and out of the way. This has been referred to as the "top forward" arrangement and a number of such drives are in operation in America.

The hot reversing mill motors form not only one of the highest-torque twin drives but also the first "top forward" twin drive in this country.

The arrangement of the two motors is shown in Figs. 9 and 10.

The top motor drive end bearing and the jackshaft bearing are mounted, respectively, above and below a stiff beam which forms a tie between the two sides of the baseplate. The baseplate is sectionalised to permit the jackshaft to be removed should this ever be necessary. The underslung jackshaft bearing can be serviced readily from beneath as there is plenty of clearance downwards. The weight of the jackshaft is taken on a built-in hydraulic jack and the bearing can then be dismantled, Fig. 9. A special built-in tackle is used to lower, first the sump (after draining), then the bearing liner retaining cap and finally the bottom and top half liners (the top half liner can be slewed round into position for lowering). The parts are lowered onto a trolley which can be run out through a passage in the foundations onto a platform in the basement directly under a hatch in the motor room floor. When the hatch cover is removed the parts of the bearing can be lifted by the motor room crane.

The five bearings of the motors and jackshaft have identical and interchangeable white metal journal bearings suitable for continuous high pressure lubrication and equipped with standby disc and scraper assemblies. The two commutator end (non-drive end) bearings also incorporate a double ring reversible flood-lubricated Michell thrust bearing operating against a collar which is part of the shaft forging. These bearings have a thrust capacity of 104 tons continuously and 315 tons momentarily. The thrust is transmitted directly to the pedestals and does not pass through the journal liners.

Since the thrust is taken at the non-drive end, the front support beam is relieved of this duty and the forces are taken to the point where the foundation block is best able to receive them. The thrust is taken between the bearing housing and the baseplate by transverse folding keys. Vertical thrust posts are cast into the foundation block and project into recesses in the baseplate. Jacking screws in the baseplate perform the double function of facilitating the initial lining up and, when the installation is complete, clamping the baseplate to the thrust posts. Thus the transmission of thrust does not depend solely upon the tightness of foundation bolts or the quality of the grouting.

The couplings between the jackshaft and the bottom motor are flanged couplings with taper sleeves for oil injection mounting. The two flanges of the coupling are bolted together by accurately pre-tensioned bolts in clearance holes. The torque is transmitted by means of radial dowels drilled into the coupling joint.

A tacho-generator is mounted on the non-drive end shaft extension of each motor. The outputs of these tachos are used for speed indication of the two motors and also to provide signals for feed roll motor control.

Each motor is supplied from two generators on the Ilgner set through a high-speed circuit-breaker and a hand-operated isolator which are mounted in the basement. The two generators for each motor are connected in series so that in an emergency either generator can be shorted out, and the mill run with reduced throughput.

Mill Motor Control

The mill motor control scheme provides the following facilities:

1. Unified control of the mill from a lever-operated controller.
2. Forcing of motor and generator fields to give rapid acceleration and retardation.
3. Automatic limitation of the degree of generator field forcing on heavy passes.
4. Automatic prevention of excessive field weakening if the control lever is moved right over on a heavy pass.
5. Automatic limitation of regenerative current if the control lever is moved quickly to the off or reverse position.
6. Protection which can be reset by the operator against excessive loads due to incorrect drafting, cold metal, etc.
7. Fault protection.
8. Prevention of creeping or provision of a low creep speed as required.
9. Hand adjustment of relative speed to take care of main roll diameters, drafting, etc.
10. Automatic balancing of load on the top and bottom roll motors.
11. Hand adjustment of the relative loads at which automatic balancing operates.

Ilgner Set

The Ilgner set consists of four generators, a flywheel, an induction motor and a tacho-generator solidly coupled together.

The arrangement of the set (Fig. 7) is:

Tacho-generator.
Two mill generators.
Motor.
Flywheel.
Two mill generators.

A third generator can be mounted at this end of the set to supply an edger motor if this is found to be necessary.

The 12 ft diameter, 28 ton flywheel has two bolted stub shafts and is carried in two Michell tilting pad journal bearings. A cradle is slung underneath and suspended from the baseplate by four long bolts. The flywheel can be lifted quickly with this cradle so that the bearing pads can be changed.

The induction motor and generators all have journal bearings with standby oil rings.

Ilgner Set Induction Motor Control

The induction motor is controlled by a liquid slip regulator. Closing the oil circuit-breaker initiates an automatic starting sequence, the pilot motor on the liquid slip regulator lifting the counter-weight to lower the electrodes so that the rotor circuit resistance is steadily reduced until the induction motor is up to speed. Slip regulation under load is controlled automatically by a magnestat.

For quick stopping of the set, dynamic braking is applied to the induction motor. Direct current is supplied to the motor stator from the main generator exciter, the energy of the set being dissipated in the slip regulator. The d.c. dynamic braking current is controlled by contactors on the main control panel. The line and braking supply isolating switches are electrically and mechanically interlocked.

Slab Shear

The slab shear is driven by two d.c. motors each driving opposite ends of a pinion shaft in the shear gearbox. The motors are supplied from two generators on the shear

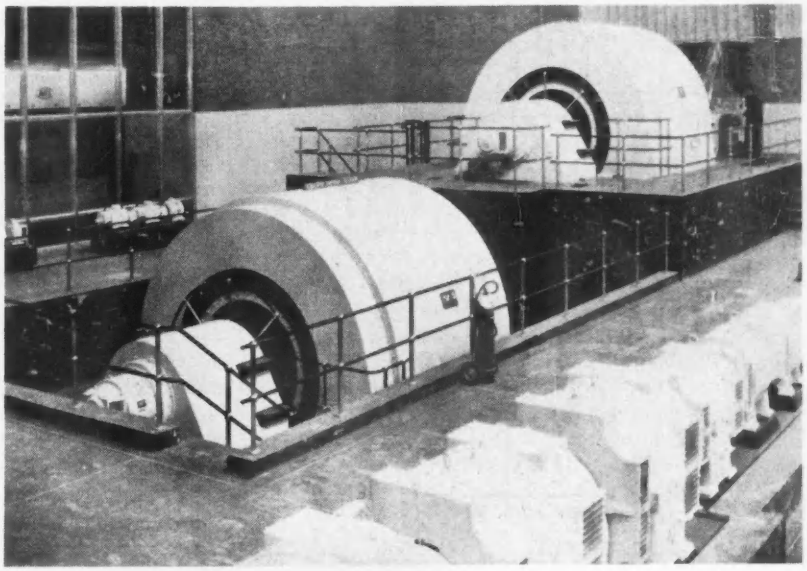


Fig. 6. Main motors for the hot reversing mill. The motors are arranged as a "top forward" twin drive, the first in the UK. Each is rated at 4,000 h.p., 30/60 r.p.m., and both are supplied from a single Ward-Leonard-Ilgner set. Details of the motor layout are shown in Fig. 10. The control room for the motors is seen in the background (left)

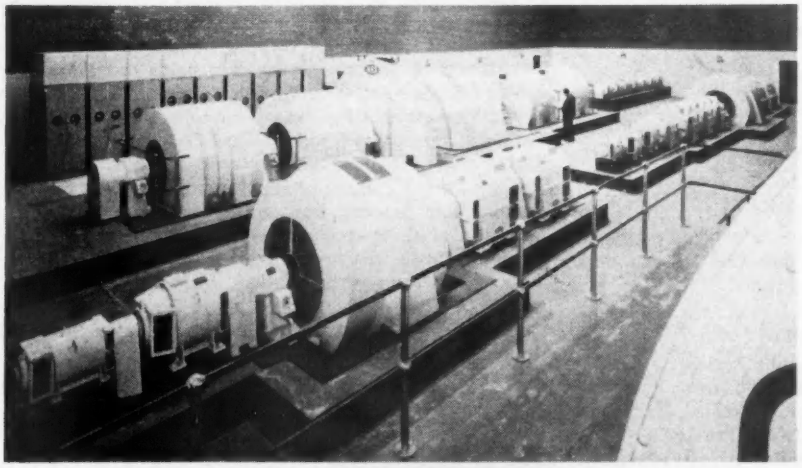


Fig. 7. Motor room viewed from top main motor. . At the left, rear, are the convertors for the table drive. In front of them is the Ilgner set, consisting of four generators, a flywheel, an induction motor and a tacho-generator solidly coupled together. In the far corner is the turntable m.g. set, driven by a 110 h.p. s.c. motor. In the foreground is the slab shear m.g. set, with the main exciter m.g. set beyond

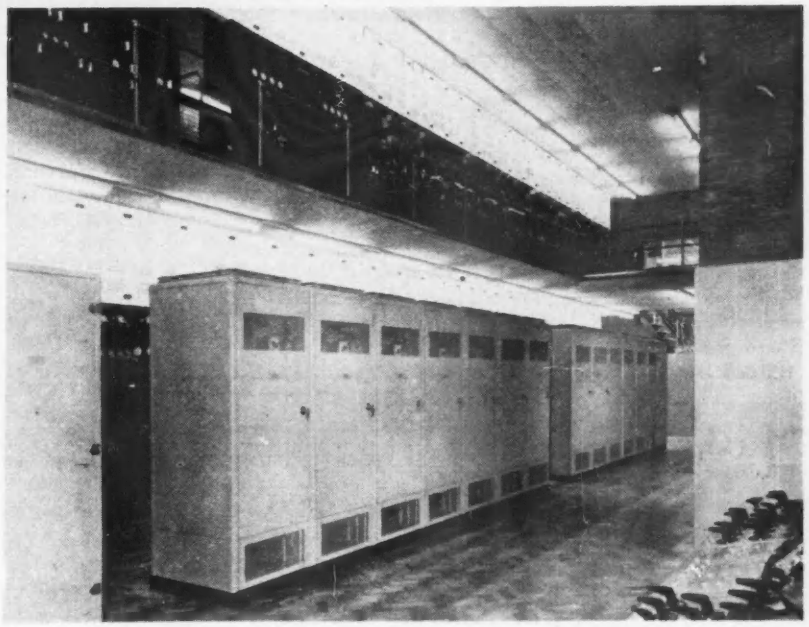


Fig. 8. Magnestat and amplifier cubicles in the control room, with a.c. control panels above. All control gear is mounted in a sound-proofed room, with a.c. control panels and distribution switchgear in a gallery. The supervisory desk from which the operator looks through glazed screens on to the motor room can just be seen, right foreground

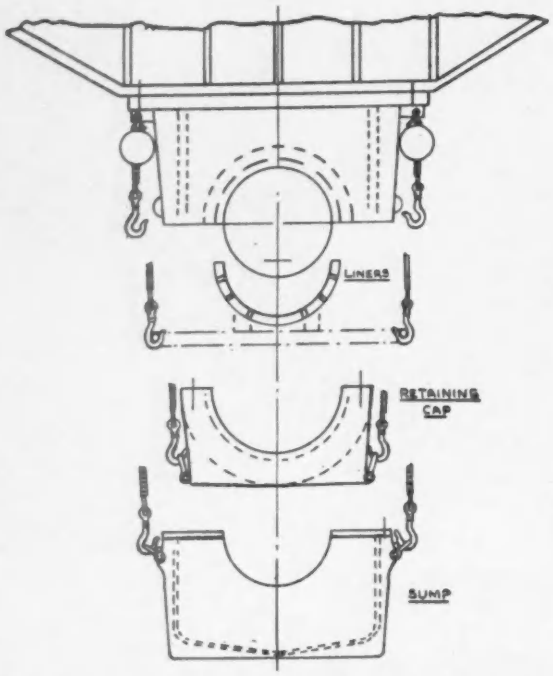


Fig. 9. Arrangements for dismantling the underslung jackshaft bearing for the top forward twin drive. (Compare Fig. 10.) The lowering tackle is built into the machine

motor generator set. Circuit-breakers and controls for the motors are mounted with the d.c. control panels in the control room. The shear is controlled from a desk mounted in the mill adjacent to the shear.

Roller Table Convertor Control

The mill roller tables are in three sections, the d.c. motors for each section being supplied from two grid controlled convertors fed from a transformer. The three transformers have a common oil circuit-breaker.

The motors are reversed by means of pneumatic switches which operate at zero armature currents.

Auxiliary Sets

There are two main auxiliary sets (Fig. 7) running at 1,000 r.p.m. The first, the main exciter set, comprises:

Synchronous motor exciter.
Constant voltage exciter—80 kW.
Two duplicate mill motor exciters—50/142·5 kW.
Generator exciter—duplicate of the motor exciters.
Synchronous motor, 1,000 h.p., 0·5 leading p.f.
Two duplicate screwdown generators—170/340 kW.
Two duplicate screwdown generator exciters.

The second, the slab shear motor generator set, comprises:

Synchronous motor exciter.
Shear generator exciter.
Synchronous motor, 1,000 h.p., 0·5 leading p.f.
Two duplicate shear generators—320 kW.

The synchronous motors supply leading reactive kVA to improve the power factor of the installation.

Other smaller sets include the feedroll and turntable motor generator set, comprising a 110 h.p. squirrel-cage induction motor and six 13·75/27·5 kW generators, two supplying feedrolls numbers 1 and 2 and four supplying turntables numbers 1, 2, 3 and 4, and a pilot exciter set comprising a 15 h.p. squirrel-cage induction motor coupled to a 2·5 kW generator pilot exciter, a motor pilot exciter and a current limit reference exciter.

Ventilation

In order to exclude the maximum possible amount of dirt and dust from the motor room and basement, the basement is pressurised and sufficient leakage is allowed to maintain an outward flow through the motor room. A low-level air intake could not be used as the motor room is in the centre of existing buildings, so the air is taken from a level well above the motor room roof and ducted into an air filtration house alongside the motor room. The air is then drawn through viscous filters by five fans, three (each 30,000 c.f.m., 1·5 in. water gauge) discharging into the motor room basement and two (4,000 c.f.m., 4·5 in. w.g.) supplying air to the two shear motors. The air supplied to the basement provides a make-up for three recirculating systems and a number of straight-through systems. These are as follows:

1. *Mill Motors.* Air is taken from the basement by two 33,000 c.f.m., 4 in. water gauge fans into a plenum chamber, from which it passes through the two mill motors, then through two coolers back into the basement. To avoid carbon dust fouling the motor room air, 4,000 c.f.m. of air is taken from the motor room and drawn over the motor commutators by a single fan. The air is then discharged outside the motor room.

2. *Ilgner Set.* The Ilgner set air is taken from the basement. Two 32,750 c.f.m., 3·5 in. water gauge fans draw air into a plenum chamber, then through the generators to an outlet air duct and through two coolers back into the basement. The Ilgner set motor takes its own air from the basement by means of fans on the motor rotor and returns it to the outlet air duct from which it is returned to the basement through the same coolers as the generator air. The flywheel takes 5,000 c.f.m. of air from the basement and discharges it into the motor room. Air is taken

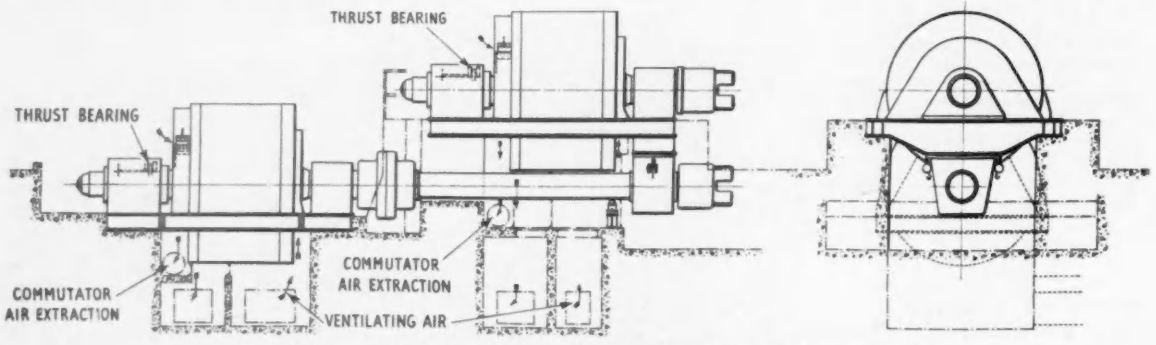


Fig. 10. Elevation of reversing mill drive, showing bearing and ventilation arrangements

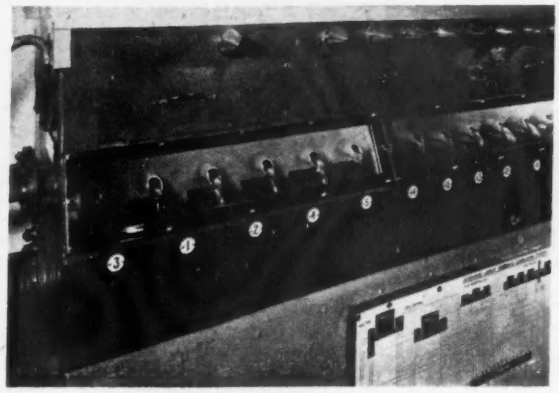


Fig. 11. Lubricating display unit showing oil returning from bearings discharging into coarse strainer baskets

from the motor room and drawn over the generator commutators by two 6,500 c.f.m. fans and then discharged into the same duct as the mill motor commutator air.

The two main systems thus take air to the machines from the basement and return it to the basement through coolers.

3. The six convertors have their own recirculating system. Each convertor has its own fan which takes air from a plenum chamber beneath the convertor cubicles and passes it over the convertor tanks into a duct at the top of the cubicles. From this duct it is drawn through the grid control cubicles by means of a further fan, and passed back through a cooler into the plenum chamber.

A make-up grille is provided in the side of this chamber to enable make-up air to be drawn in from the motor room basement. Heaters are provided and modulating valves are used to control the water flow through the cooler so that the convertors are maintained at an almost constant temperature.

The Ward-Leonard auxiliary motors are supplied with air from the basement by means of two of three 5,750 c.f.m. fans. The third fan is a standby.

Lubrication

A comprehensive lubrication system is provided for the rotating machinery in the motor room. The lubrication room is located in a corner of the motor room basement. Two motor-driven flood-oil pumps are mounted on a common tank. One pump is a standby. From the pumps the oil passes through a motor-operated self-cleaning filter and on through one of two coolers (one again being a standby). Part of the supply is then passed back to a cool oil pocket at one corner of the tank which forms a reservoir of cooled oil for the suction side of the high-pressure pumps. This pocket is separated from the hot oil by a weir, the level of which is slightly below the running oil level of the tank.

The remainder of the flood oil supply passes to the control point which consists of a long, narrow tank with glass covers and interior lighting. At the top of the control tank is a header pipe from which the following five grouped supplies pass through flow switches:

1. Top mill motor—thrust (non-drive end) bearing.
2. Bottom mill motor—thrust (non-drive end) bearing.
3. Ilgner set—eight bearings.
4. Main exciter set motor—two bearings.
5. Slab shear motor generator set motor—two bearings.

After the flow switches each group is subdivided and individual control and stop valves control the supply to each bearing. The control valves are mounted in a line along the top of the control tank. The oil from each bearing is returned through a nozzle at the back of the tank into an open basket strainer. The supply to any bearing can be set by means of the control valve and the effect can be gauged immediately by measuring the flow from the corresponding oil nozzle from that bearing which is directly below the control valve. Dirty or damaged bearings can, therefore, be detected and isolated at the control tank. The oil from the control tank drains back into the main oil tank.

From the cool oil pocket of the main oil tank suction, pipes are taken to high-pressure pumps for the mill motor and Ilgner set flywheel bearings.

The thrust bearings at the non-drive ends of the mill motors are supplied with flood oil from the control tank. The five journal bearings are arranged for continuous high-pressure oil lubrication by individual pumps driven by a single motor. The flood oil supply to the thrust bearings is indispensable (this is the main reason for the provision of the standby cooler and pump on the main oil tank) but the journal bearings have standby discs and scrapers which will provide adequate lubrication for very long periods if the high-pressure oil supply fails.

All the Ilgner set bearings are arranged for continuous flood lubrication and the two flywheel bearings are also supplied with high-pressure jacking oil during starting. A high-pressure pump is provided for each bearing, the pumps being driven by a common motor. The jacking oil supply has to be established, as detected by flow switches in the return pipes, before the flood supply can be started. Standby lubrication is provided on the flywheel bearings by disc and scraper and on the remaining bearings by oil rings.

The bearings of the two synchronous motors on the main exciter set and the shear motor generator set are arranged for flood oil lubrication and have oil rings for standby supply.

All bearings are fitted with oil temperature gauges with electrical contacts for alarm and shut-down if the bearing temperature becomes excessive.

Mill Pulpit

The air-conditioned mill pulpit is mounted on the opposite side of the mill from the motor room looking diagonally onto the ingoing end of the mill (Fig. 4).

The mill operator sits at a desk in the pulpit and controls the main mill drive by means of a lever-operated controller mounted in the desk. The main roller tables are normally controlled with the mill, but the control of some tables can be transferred to the shear desk or to the 96 in. mill operator by means of selector switches on the plate mill desk. A mimic diagram on the right-hand side of the mill operator shows which control positions have been selected.

Selsyn-operated screwdown indicators and a load-balance meter are mounted on the mill side of the pulpit just below the operator's line of sight to the mill.

Acknowledgement

The author wishes to thank Alcan Industries Ltd. for permission to publish this article.

(Part 2 of this article discusses control features of the installation.)

R.N. electrical engineering

I.E.E. PRESIDENT SURVEYS ELECTRICITY AFLOAT

ELECTRICITY has been used in the ships of the Royal Navy since the 1870s, when electric firing of guns was introduced. In his inaugural address to the IEE last week, the president, Sir Hamish MacLaren, K.B.E., C.B., D.F.C., LL.D., B.SC., M.I.E.E.,* traced the growth of importance and complexity of warship electrical installations from that time onwards. His account was detailed and kept close to engineering facts with few of the wider observations incoming presidents sometimes permit themselves. At its conclusion, Sir Hamish looked ahead to a drive for increased reliability and reduced weight in all types of equipment afloat, and to the generation of power at voltages above 440 and frequencies higher than 60 c/s. Already, electricity accounts for 30% of the cost of a warship.

Wartime Lessons

In a necessarily shortened account of Sir Hamish's address, the interest of the early years must be passed over. The war of 1939-45 brought to the forefront problems still exercising naval electrical engineers. Prominent amongst them was that of shock effect on electrical equipment. One of the first warships to suffer from the magnetic mine was HMS *Belfast*, and it was found with some consternation that the mechanical shock imposed by the underwater explosion was sufficient to immobilise the ship by the extensive damage it did to the electrical installation.

Immediate action was taken to improve design, which in this respect had previously been based on vibration caused by detonation of weapons in the ship rather than the effect of high explosive directed at it. A new testing machine was rapidly developed and supplied to manufacturers, and the ideas passed to the US Navy. Evaluation of shock has remained an important part of the work of the ship department of the Navy.

Another ship casualty which caused revision of electrical thinking was HMS *Ark Royal* in November, 1941. Although only one torpedo hit her, the resulting explosion was disastrous because it resulted in flooding of a boiler room and the main switchboard room. The inaccessibility of the main switchboard meant it was impossible to close circuit-breakers by remote control to restore services; and hand operation was impossible because of the state of the ship. The fatal situation arose because control wiring from the main board was always energised.

The solution evolved was use of a relay system in which the energising power to operate or maintain the breakers in their open or closed state was contained within the c.b. enclosure. A change of state was achieved by energising the control coil of a relay, otherwise dead. In emergency, energisation could be supplied by a secondary battery. This arrangement made it possible to introduce secondary control positions for sections of the ring main distributed throughout the ship.

Another lesson learnt from the loss of *Ark Royal* was the need to have generators capable of maintaining essential supplies after steam had been lost. A programme of installing standby diesel generators was put in hand.

Post-war Progress

Growing load on board ships soon made it clear that the d.c. ring-main system could not meet all requirements. The limit of capacity of single generators with existing ring-main switchgear was 500 kW, and 1,000 kW minimum was needed for ships being designed at the end of the war. Investigation showed that weight could be saved, even in a relatively small warship with a total of 1,000 kW installed generator capacity, by adopting 400 V 60 c/s three-phase a.c. distribution. Such a system had been used by the US Navy for some time; 440 V as the basic system made possible 115 V single-phase for lighting and small power loads, a voltage suitable from the aspect of mechanical strength of filaments, and also from the shock risk point of view. Although there was a theoretical case for a frequency higher than 60 c/s, it was felt that to take advantage of this would involve a scale of departure from standard designs difficult to justify.

Consideration was given to 50 c/s to meet land practice in this country, but the added weight penalty resulting from the lower speed was felt quite unacceptable.

When working out the details of the new a.c. system, it was necessary to lay down voltage regulation standards. It was decided to base design on the use of rapid-response a.v.r's with the cable system designed to give minimum practicable voltage drop. This obviated the need to incorporate voltage stabilising equipment in some classes of apparatus. The voltage limit set at generator terminals was $\pm 1\%$, with the drop due to starting the largest induction motor not to exceed 15%. After such a voltage drop, recovery to $\pm 1\%$ regulation was required within 0·3 sec, later extended to 0·5 sec.

Some conversion to 400 c/s and 2,400 c/s was necessary, the frequencies being nominal and in general the supplies taken from induction-motor driven generators. D.C. supplies are now being taken from silicon rectifiers.

No earthed neutral was provided on the 440 V three-phase system. Earth faults were indicated at switchboards, and dealt with by maintenance staff as soon as possible. In view of the shock risk, all 440 V equipment was provided with "difficult access" covers. Main switchboards were totally enclosed with dead fronts.

One of the requirements of a warship electrical system is that it should be operable after extensive damage. Emergency cables are an important asset in this respect, and they are provided with plug-in connectors which have safety sleeves which retract when the plug is inserted in the appropriate socket. The plugs can be inserted only in the appropriate phase socket and are locked by an insulated key. In cabling generally, substitution of polychloroprene for lead sheathing has been a weight-saver.

* Sir Hamish was, until recently, Director of Electrical Engineering at the Admiralty.

AROUND THE TRADE

BY PEREGRIN

OUR few days of October Indian Summer brought so much rain that the autumn trade is off to a good start. Fires, and particularly convectors, are going well, but in spite of so many wet washdays spin-dryers still show no sign of life. The public appears to be becoming increasingly conscious of the value of the convector in a cold corner—due, probably, to better publicity. The change to the term "space heater" conveys more to the ordinary mind than convector; the relative values of radiation and convection have usually to be explained in words of one syllable! There are now far too many makes, shapes, sizes and colours to choose from, with the ever-increasing difficulty of deciding what to stock. Invariably the customer wants yellow when the trader has chosen to stock red. Of course one can always offer to get the yellow, but taking verbal orders from the public holds many pitfalls. With old customers the matter is simple, but with strangers all sorts of problems arise. I have known customers swear they have never been in the shop even when confronted with their name, address and particulars of order in the book which all good traders keep for that purpose. The true fact is that on the way home something else has caught their eye in another window and, buying it, they have ignored the small matter of courtesy in cancelling the first request. Taking a deposit helps—*if* you can persuade the customer to take delivery and pay the balance. Otherwise you may be faced with an odd book-keeping entry which cannot be cleared.

Christmas Orders

The problem of orders occurs all the year round, but especially just before Christmas when trade is brisk and goods run short. It is the same with some refrigerators in the summer; one good spell of really hot weather and the entire stock is sold out, although the manufacturers have had all the winter to get ready. I can never make up my mind whether it is lack of faith in their own goods that is the trouble, or dissipation of energies over too many lines, or anxiety to ensure complete clearance of the season's stock so that they can bedevil the poor trader with some new gimmick or trimming to make his stock look old hat. I am sure that the Domestic Appliance Fair, which failed to materialise, could have done a lot to help all sections of the trade settle such problems, and like the small boy who saw RIP on a big flat tombstone, I feel it should mean Rise If Possible!

Firelighter

I am reminded that earlier this year I asked what had happened to the new GEC firelighter, which had not yet made its appearance on the market. I hear this was demonstrated last month at the British Coal Utilisation Council Training Centre, accompanied by the usual light refreshments. As I was unable to attend the demonstration I never discovered whether they boiled the kettle on the fire lit by the firelighter, but I must say I like the idea of the design. I have sold one make after another of firelighters as they have come on the market, since the days of the pre-war Morphy-Richards, and have seen them all burn themselves out and fade away—but this one should stay the course: I shall lose no time in trying it out. Also I see it can be used for lighting the garden incinerator or bonfire—pity it will not act as a miniature flame thrower on my garden paths.

Retailing and N.E.C.T.A.

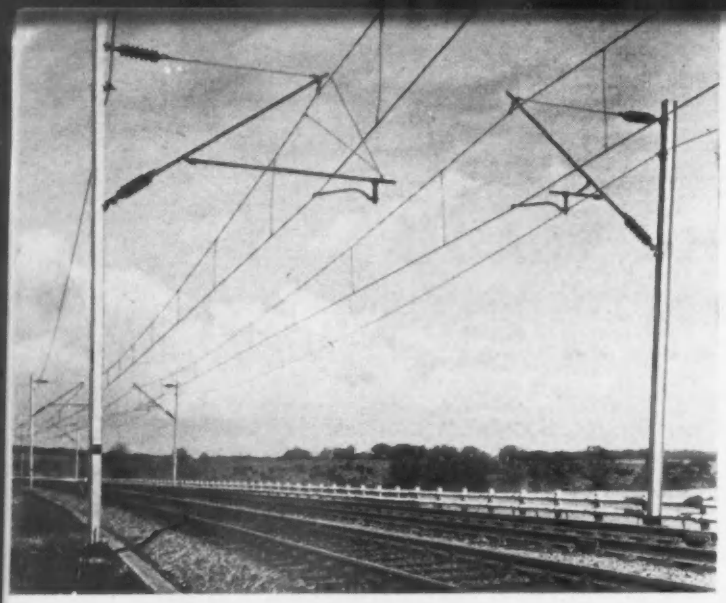
I was pleased to hear that Mr Dennis Jones had been appointed by NECTA to be responsible for the retailers' service side of the association. By the way, I hope both Mr Jones and the chairman of the Retail Committee had the opportunity of enjoying the GEC hospitality. Retailing is quite a separate and different kind of job from contracting and, I am afraid, many of the large contractors neither realise nor care about the difficulties which beset the retailer, large or small: Therefore NECTA did not seem to me to be competent to deal with these difficulties without some separate department. Since the Retail Committee was formed, great progress has been made, but still without that urge that such a committee should have behind it. Perhaps with the advent of Mr Dennis Jones and—dare I suggest it?—a slight change of name, we may see ever greater results. Staff training is to be one of his objects, and I should say not before time. The level of staff interest, knowledge, and intelligence so often seems to bear little relationship to the expense of keeping them in a job. And this also applies to apprentices on the contracting side. These apprentices are a real problem and an expensive proposition today, when they have to be paid while they are taught their three R's before they can start to assimilate some of the more technical details. Often they attend day school in their employer's time, and dodge the evening classes in their own. Some leave the course or the employer, or both, before the end of the term and the results when some of the reports come through are deplorable. One fellow-contractor tells me he has wasted over £165 in the last three years on this type of youth, but he did enthuse no end over the very few ewe lambs who had stayed the course and made the grade.

Recruiting

Now we have reached the post-war birthrate-bulge youngsters we may have a chance to pick some better types for our section of the industry. The pity of it is that any sign of brains in the youngster usually means a university course: With the result, as one professor put it, that usually only one in a class of would-be scientists is really worth the money expended on his training. The others are mediocre stuff who could have made good plumbers, carpenters and electricians, as distinct from the hewers of wood and drawers of water. Perhaps it is time the more skilled work-a-day jobs were viewed in a different perspective by headmasters to whom success seems only to mean scientists and teachers.

50 c/s systems

ELECTRIFICATION CONFERENCE



General view of the 25 kV overhead structure and wiring between Colchester and Hythe on the Colchester-Clacton-Walton line, Eastern Region, British Railways

DISCUSSION on the first series of technical papers to be presented at the BTC conference on 50 c/s traction got under way on Tuesday of last week. In our issue for last week we referred to the opening of the conference and exhibition and summarised the salient points in the series of papers dealing with power supply, which included those presented by Mr W. J. Webb, assistant systems engineer, BTC, and Messrs W. Casson and W. L. Kidd, of the CEGB. The discussion on these papers is reported later in this article.

Systems Measurements

The session on Tuesday was opened by Mr J. A. Broughall, Development Engineer, BTC, who outlined the techniques developed for tests on British Railways' 50 c/s systems which are believed to be the first applications of their type in the world.

Systems tests carried out on sections of the Eastern Region scheme are aimed at obtaining a picture of electrical performance of the traction system as a whole, assessing the performance of individual items of electrical equipment and measuring the effect of a.c. traction on signalling and public communication systems.

Knowledge of the precise way in which electrical traction systems behave will enable close programming of trains and the preparation of accurate timetables. More exact knowledge of train and system capabilities should enable the loads which may be attached to locomotives to be assessed with the certainty that locomotives and rolling stock are being efficiently employed.

Although the systems tests are in their initial stages, the method shows considerable promise. The various quantities to be measured are first converted by transducers, potential dividers and similar apparatus into d.c. voltage signals. These signals are fed to digital recorders each scanning a group of 12 readings every two seconds. Tests made on the Colchester-Clacton line used fixed recording equipment sites along 18 miles of track and a further eight units mounted on multiple stock. All the recorders were controlled remotely, either by wired circuits for the fixed items or by carrier frequency signals impressed on the overhead wire for the train units. On this first trial about 140 variables were recorded varying from the 132 kV grid voltage to movements in fractions of an inch. The various readings were punched on tape and fed to a digital computer for analysis.

Mr Calverley (E.E. Co.) thought the systems tests might be valuable if applied to d.c. traction schemes. He quoted the case of rectifier current waveform which is, in general, far removed from the theoretically expected shape on traction systems. He asked if a train position could be accurately determined by systems test equipment. In reply, Mr F. J. Lane, co-author of the paper, said that although train pick-ups were only sited at mile posts, it was possible to obtain the actual train position with great accuracy from the readings taken by an integration technique.

In the discussion, Mr C. C. Ingles (BTC) said the Commission were operating 14 computers with one devoted entirely to scientific and engineering analysis of problems peculiar to railway systems.

Comments on a method of insulating under bridges were made by Mr T. W. Wilcox (Merz and McLellan) who described the use of butyl rubber shields placed between the catenary wire and the underside of bridges where clearances were exceptionally small. The essence of the device was to allow a controlled discharge through the surface resistance of the shield under certain condition as, for example, when the pantograph lifted the contact wire, when excessive pollution from a steam locomotive lowered the dielectric strength or when a transient voltage appeared on the line. On one installation, no damage to the insulation shielding was noted after 14 discharges exceeding 2 A and numerous lighter current breakdowns.

Locomotives

The salient design features and specification requirements for the locomotives were outlined by Messrs Cox and Kibblewhite, BTC. (Some of the constructional aspects were dealt with in ELECTRICAL TIMES, 29 September, describing the Battersea Wharf exhibits.)

Requirements for the different regions vary considerably. For the London Midland Region, mixed traffic locomotives

Principal Papers Presented at the Conference

The Application of the 50-cycle System as Proved by System Tests—*J. A. Broughall, B.Sc.(Eng.), M.I.E.E., F. J. Lane, O.B.E., M.Sc., M.I.E.E.*

The Locomotives—*E. S. Cox, M.I.Mech.E., G. G. Kibblewhite, B.Sc.(Eng.), A.M.I.E.E.*

The Multiple-Unit Trains—*H. Wilcock, B.Sc.(Eng.), A.M.I.Mech.E., C. J. Clemow, B.Sc.(Eng.).*

The Power Supply—*W. J. Webb, B.Sc.(Eng.), M.I.E.E.*

The Overhead Line Equipment—*E. Claxton, B.Sc.(Eng.), M.I.C.E., M.I.E.E.*

Research for A.C. Traction—*Dr F. T. Barwell, Wh.Sch.Ph.D., B.Sc.(Eng.), M.I.Mech.E., A.M.I.E.E.*

Signalling & Telecommunications—*A. W. Woodbridge, O.B.E., M.Sc., M.I.E.E.*

The Interference Problem—*H. R. J. Klewe, D.Ph., M.I.E.E.*

on British Railways

PAPERS AND DISCUSSIONS

Electronic digital recorders at Colchester. As many as 140 variables, ranging from kilovolts to fractions of an inch, are monitored with precision whilst normal traffic is running

will be most suitable but, for the eventual electrification of the Eastern Region main line, freight haulage will predominate. The initial fleet consists mainly of mixed traffic locomotives, but five will have a lower gear ratio to enable experience to be gained with high-speed freight haulage. Because of difficulties in adapting existing wagons, this duty will be of a limited nature for some time.

The locomotives were specified to be capable of hauling a 475-ton train at 90 m.p.h. on level tangent track with a maximum speed of 100 m.p.h. An average speed of 67 m.p.h. under typical conditions would give a 9% improvement on steam locomotive timing for express trains. Freight haulage requires a 950-ton train to maintain an average speed of 45 m.p.h. and, recognising that bad fog conditions are likely in this country, it was also specified that no damage to the electrical equipment must result through running at 10 m.p.h. for 10 miles.

Track limitations required a maximum axle weight of 20 tons, a minimum wheel diameter of 48 in. and the fitting of flexible drives. As far as possible, standardisation has been introduced especially for equipment handled by the train crews.

It was necessary to consider the alternatives of mercury-arc or semi-conductor rectifiers, the most suitable design of traction motor and the auxiliary equipment.

The driving motors were to be designed to give good commutation with a current ripple of approximately 30%, and brush life was specified to be of the order of 60,000 miles with an interval between major overhauls of 250,000 miles. So far little test information is available, but two problems to be resolved are ways of obtaining more room in the locomotive body and whether the flexible drive between the motors and driving axles is worth the many thousands of pounds it adds to locomotive cost.

In the discussion, Mr Wayman (AEI) applauded the decision to obtain track measurements and to remove, as he put it, locomotive design from the metaphysical to the engineering field. The tests would probably be the first made and it was to be hoped they would resolve the many theories on motor suspension.

Two French representatives referred to developments on the SNCF system made in 1955, which confirmed many of the tests since made on British Railways. They referred to the coupling of axles as a means of increasing tractive effort and said silicon rectifiers had been found satisfactory for locomotives operating over several types of systems.

The great potentialities of 50 c/s systems over the d.c. system for future development were emphasised by Mr Ingles (BTC). He asked manufacturers to consider whether all their fuses and relays were really necessary. Simplification had reduced maintenance in the past without impairing safety. Commenting on the difficulty of measuring track reaction, he said that work was proceeding and that one four-mile section of track had been equipped with strain gauges as part of a programme to find the precise cause and magnitude of stresses.

The question of sensing changeover between the 25 kV and 6·25 kV sections of track was raised by Mr Fukusake (Japanese National Railways). In reply, Mr Kibblewhite said inductors on the track adjacent to the section with changed voltage acted on magnetic pick-ups which operated relays in the locomotive. Other sensing devices were incorporated to ensure that the measured voltage change was due to a deliberate system voltage change and not to abnormally low system voltage such as might occur under fault conditions.

Multiple Unit Stock

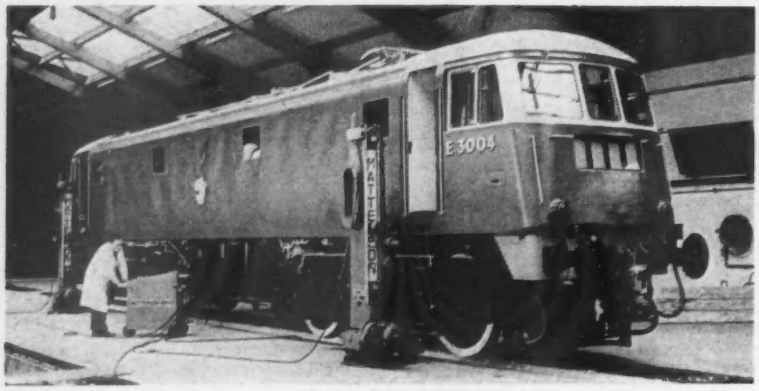
On Tuesday afternoon the discussion was on two groups of papers, the first dealing with multiple unit stock for suburban and main line services, and the second with railway power supplies.

Mr C. J. Clemow (BTC), in a brief transcript of the paper by himself and Mr H. Wilcock, described the constructional requirements for the multiple unit stock. A large fleet of these units had been ordered to a specification which called for a maximum service speed of 75 m.p.h., a mean starting acceleration of 1·1 m.p.h./sec and the ability to start a loaded four-coach train from standstill on a 1 in 70 gradient with two motors cut out.

The electrical equipment included forced-air-cooled main transformers, rectifiers and traction motors, all mounted on the underframe, and a large measure of standardisation was introduced in the layout and general construction of the trains.

The transformers incorporated a four-section primary winding, and an electro-pneumatic tap changer for connection to either the 25 kV or 6·25 kV systems. Speed control is by secondary tap changing with current-limiting chokes or resistors.

In the supporting papers, details of the differences in applying the control and regulation to the motors on the four sections were described. For London-Tilbury-Southend, the English Electric arrangement incorporated mercury-arc rectifiers bi-phase connected across the four-section secondary of the transformer, the two outer sections being tapped to give the starting and accelerating steps. The motors, in series pairs, are each connected across one pair of rectifiers.



An AEI electric locomotive being lifted by four electrically operated jacks at Longsite depot

For Glasgow suburban, an AEI arrangement incorporates mercury-arc rectifiers connected in bridge across the secondary winding, with equal tappings simultaneously stepped from each end and the motors, in parallel, coupled between the secondary and rectifier mid-points. The AEI scheme for the Manchester-Crewe line provides for a bridge connected germanium rectifier across the transformer secondary feeding the four motors in parallel while the GEC plan for the Liverpool-Enfield-Bishop's Stortford line comprises two series pairs of traction motors each across a bridge connected full-wave mercury-arc rectifier circuit coupled to the tapped secondary winding of the transformer.

By the end of the year, over 400 of these multiple-unit trains will be in use and already satisfactory operation has been obtained with all types.

Discussion

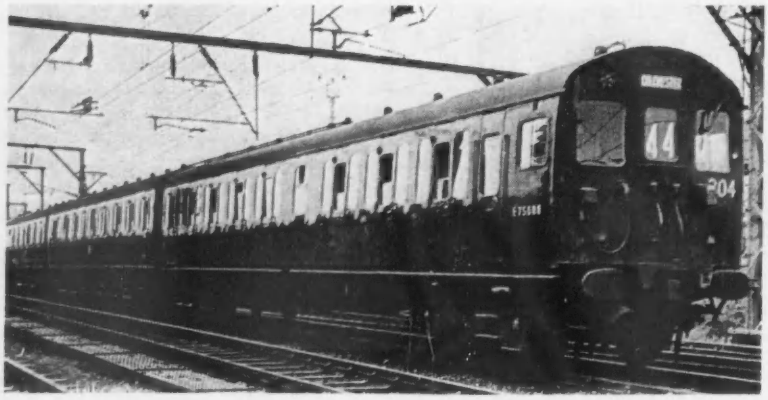
A strong plea for reliability in electrical equipment was made by Mr W. J. A. Sykes (CM and EE, Southern Region). On the Southern Region, equipment needed adjustment every two weeks 30 years ago; today the minimum period was 4½ months and, should conditions prevent overhaul immediately, it could go for a further period of 4½ months if necessary. He hoped that the new stock would also have the same degree of inbuilt reliability. A further point was the capacity of a multiple train set to assist disabled trains. Had this been taken into account? Mr Clemow replied that both points had been fully considered and catered for.

Mr W. G. Jowett (English Electric) asked why Buchholz protection was used on the locomotives but not on the multiple unit stock transformers. Mr Clemow replied that the small clearances under the coaches where the transformers had to be mounted precluded the use of Buchholz relays in their present form but this matter was being considered and he hoped that a modified form, suited to this type of location, would ultimately be developed.

The opinion that mercury-arc rectifiers and 50 c/s a.c. single-phase traction motors were now becoming obsolescent in view of the progress made with semi-conductor rectifiers was expressed by Dr J. C. Read (AEI). The main problems to be solved were overload protection and over-voltage protection for semi-conductor rectifiers. He also stressed the importance of cleaning. Mr S. B. Warder (BTC) replied that this was the sort of opinion in which he was much interested. It was for the manufacturers to argue among themselves. As far as he was concerned, he was prepared to accept either mercury-arc or semi-conductor rectifiers so long as performance and price were satisfactory.

Mr Junkers (Netherlands Railways) questioned the difference in the speeds and accelerations between main line locomotives and suburban multi-unit stock. Could not the latter be uprated to main line performance with advantage? Mr Clemow replied that it was a matter of economics. The present figures had been agreed in the early design stage as the most economic for the conditions prevailing. Mr E. H. Jarvis (English Electric), asked if frequent replacement of contactor tips would not be avoided by the adoption of a form of notchless control using transductors. The smoother acceleration would also assist in avoiding wheelslip. Mr Clemow replied that this was a possibility which was still under consideration.

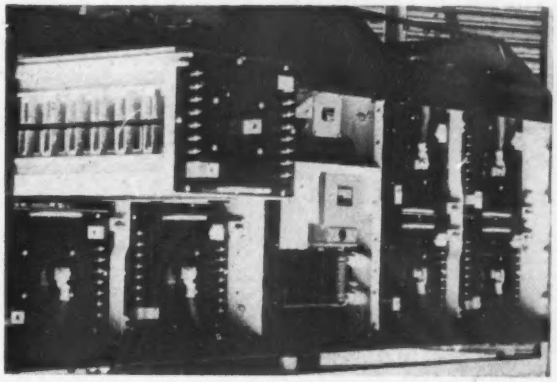
Dr Thompson (GEC) referring to Dr Read's comment, said that if indeed the mercury-arc rectifier was becoming obsolescent, like King Charles, it was an "unconscionable time in dying." The steel tank type arc rectifiers which had been installed on the railways had been examined after 20,000 miles running and were in excellent condition. This was admittedly only a moderate mileage for a locomotive but an examination of the units indicated that they were as good as new and rough riding tests showed that they were robust enough to stand up to any conditions normal to rail transport.



A multiple unit a.c. train with English Electric equipment as now in service on the Eastern Region of British Railways

Power Supply

The group of papers dealing with the power supply were briefly outlined by Mr W. J. Webb (BTC) on Tuesday afternoon after which discussion was invited. The first to respond was Mr J. E. J. Ankerschmit of the Netherlands Railways who asked why we did not take advantage of the improved load distribution which could be effected by paralleling adjacent substations. Mr Webb



A silicon rectifier unit of English Electric design and construction as supplied to British Railways, Eastern Region, for the motor coaches of a.c. multiple unit stock

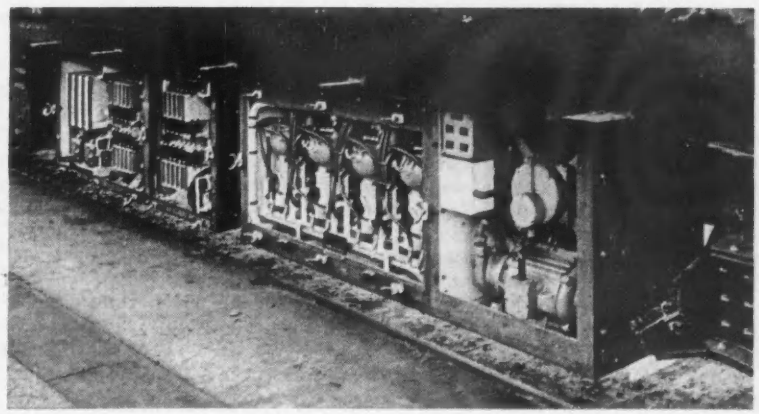
replied that this was related to the problems of taking supply from the CEGB. Different sections of the 132 kV system were not necessarily in phase and to parallel them through the railway system would necessitate synchronising the CEGB systems, apart from which the railway conductors would then also be transmitting part of the balancing load between adjacent CEGB substations. Line losses in respect of these loads would be registered on the BTC meters and, presumably, charged for. In present circumstances, separate operation was essential for satisfactory working.

Mr J. K. Fletcher (Standard Telephones) said his interest was mainly on supervisory remote control systems. These played a significant part in reducing operational strain on the part of the staffs. Had adequate advice been received from experts on these systems and was there not room for improvement. Mr Webb replied that this had been given the fullest consideration at all stages; in fact the techniques had so far advanced that it was now the practice to install control cabins above ground with adequate windows so that the personnel had a good view of what was going on outside, a marked contrast to the underground, air conditioned "sealed cells" of a few years ago.

Mr D. P. Sayers (Chief Commercial Officer, CEGB) remarked that little had been said about economics. The railways had been given the most favoured rates for their supply which were based on a two-part tariff. On the main lines the load factor was exceptionally good, ranging from 60 to 70%; on the suburban lines it was lower, averaging around 40%. Development of night freight traffic would enable more advantage to be taken of the off-peak rates and would contribute to lower overall running costs. Mr S. B. Warder agreed and said that efforts were being made to increase night freight traffic. All that remained was to persuade the public to travel at night instead of by day.

Overhead Line Equipment

On Thursday morning Mr E. Claxton, of the British Transport Commission, summarised his paper outlining past and present problems on overhead line equipment at 25 kV and 6·25 kV. The first was an organisational one in which the planning, construction and erection of the equipment had to be programmed and arranged with the minimum interference to existing traffic over the lines. As this work was contracted out on a competitive basis, it was essential that a careful specification be prepared to enable the would-be tenderers to have an accurate idea of the task in hand. In Britain, the task was complicated in that the space available for the erection of trackside equipment was restricted and the large number of overbridges, which in some places averaged 1½ to 2 per track mile. Many of these gave insufficient clearance for the erection of even the 6·25 kV line and had to be reconstructed, but that was the civil engineers' headache.



A side view of a motor coach in a multiple unit train showing the undercar mounting of the GEC rectifier and casing

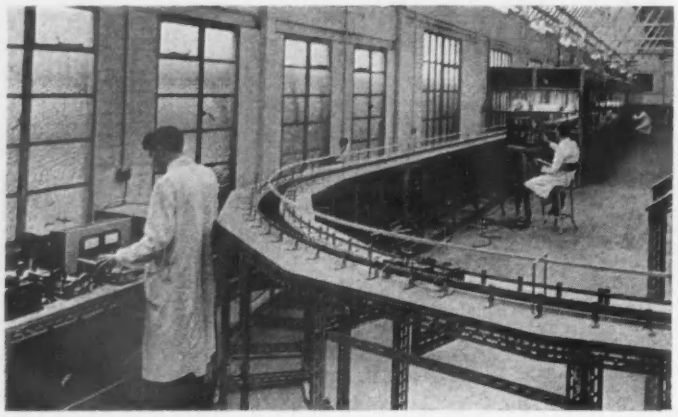
Atmospheric Pollution

The atmospheric pollution in Britain was also on a scale not to be met with in any other country and this necessitated careful study of insulator and conductor behaviour against flashover and corrosion. In so far as insulators are concerned, solid core glazed ceramic types were used in general; semi-conducting glazes have not proved satisfactory through smoke and other deposits on the surface. Because of the pollution problem, long creepage paths had been adopted to reduce maintenance cleaning periods. 42 in. creepage paths are normal for 25 kV and 16 in. on 6·25 kV. Other and newer insulators are being tried, notably those incorporating p.t.f.e. and bonded fibreglass.

Under bridges butyl rubber mats are used where the clearance to bridge structure is restricted. The clearances adopted for the two voltages between load gauge and live equipment is 11 in. for 25 kV and 4 in. for 6·2 kV, but with the decline in the amount of steam traffic it is hoped to be able to reduce the clearances for 25 kV.

Discussion

Experience in France, where 2,000 km of 50 c/s a.c. line had been constructed in the last ten years, indicated that maintenance on special forms of insulation was disproportionately high. That was the comment of the first speaker, Mr J. G. Walter (SNCF) who, however, commended the optimism of British engineers in using the newer materials and wished them luck. In regard to the policy of using compound catenary for overhead cable support, he thought that this was unnecessarily expensive and, in his experience, two wire stitched catenary was adequate up to 100 m.p.h.



General view of BICC Group railway traction research laboratory at Tolworth

Brigadier Langley (M.o.T.) said that he was concerned with safety requirements and asked if the present 25 kV clearances were not reducible. Referring to the flashover tests which had been carried out between steam locomotives and the overhead line last year, these seemed to indicate that the existing minimum clearance was more than adequate. This was pertinent to the level-crossing problem where it was laid down that clearance gauges on the road approaches should be set to give a 1 ft 9 in. clearance between the top of the load and the live conductor. A system used in the Netherlands for isolating the 3 kV d.c. Belgian and 1,500 V d.c. traction systems in Holland was described by J. E. J. Ankerschmit. This was just a simple gap which allowed the pantograph to rise to its upper limit between the sections and he suggested that this might be more economic than the insulating sections adopted by the British Railways. The reply was that, at the speeds which we were using, the main problem was the proper re-establishment of contact between the pantograph and the wire which would need an extremely long run-in after the gap and where the insulating sections were close to bridges this would introduce constructional difficulties. Mr M. I. Yasuna asked why ice loading was allowed for on the catenary supporting cables but not on the conductor. Mr Goldring replied that the frequent passage of pantographs prevented ice forming on the conductor and no trouble had been experienced to date from this cause.

Research for A.C. Traction

In the paper on research presented by Dr F. T. Barwell (BTC), three aspects of research were given particular attention. These concerned track adhesion, current collection and insulation. Other aspects were detailed in the paper. Adhesion between wheel and rail, constituting the overriding limiting factor to the tractive and braking forces of locomotives and multiple unit stock, is a topic of extreme complexity. The basic causes of friction were still not completely understood. Oxydised steel rubbing against itself had a coefficient of friction of 0·6; why, then, do railways record much lower values and why do they fluctuate so much to their embarrassment? Why should the coefficient rise just before slipping occurs and why should it sometimes fall off as speed increases? These were questions going far beyond the ordinary field of applied research and needed the physicist's fundamental approach.

Studies of pantograph behaviour had been made from special equipment mounted on the vehicle roof. The effects of rise and fall of the conductors and catenaries had also been investigated and newer forms of insulation were being examined under the conditions in industrial and coastal areas which give rise to corrosion.

Dr A. L. Williams (BICC) said that he had long been concerned with research on overhead line construction and behaviour and was appalled at the vast programme which lay ahead on current collection. He was all for the experimental work on insulation being done by the user rather than the manufacturer since laboratory research rarely approached the conditions actually in service. In regard to adhesion, he asked whether sufficient laboratory work was being done. Was this not a suitable subject for university study? Mr C. C. Inglis (BTC) said that, on this subject, the British Transport Commission, in conjunction with BEAMA, had recently sponsored a readership at London University on electric traction. It was hoped that this was where such studies could be made and not the least of the objectives was the one of raising the status of the traction engineer.

Signalling, Communications and Interference

On Thursday afternoon, papers on signalling and telecommunications were presented by A. W. Woodbridge (BTC) and on the interference problem by Dr H. R. J. Klewe (BTC). In the former, the interests of both the signal and the electrical engineer in the running rails were described and the various methods of track circuiting used in the past were discussed.

On the subject of interference, Dr Klewe dealt with the general aspects of interference with adjoining signalling and telecommunication circuits by electric railways, gave the mathematics of induced e.m.f's and screening effects and concluded with an explanation of the methods adopted by the BTC to combat interference.

The Guildhall Banquet

To mark the conclusion of the conference, a banquet was held at the Guildhall last Friday under the chairmanship of Lord Chandos, who proposed the toast to the Lord Mayor and Corporation of London, to which the Lord Mayor replied. The President of the Board of Trade, the Rt. Hon. Reginald Maudling, in proposing the toast of "International Co-operation," pointed out that often Great Britain had led in engineering, and other countries who had followed us had profited by our experience, sometimes to our disadvantage in trade. Now that we had come late to railway electrification, we could improve on what had gone before. This was not a disadvantage.

M. Dargeou, Director-General of the French Railways, responded, telling of some early experiences in railway co-operation. Essentially, from the very nature of their work, railwaymen were internationally minded, he said. He particularly stressed the work of the International Union of Railways.

In his capacity of president of the Locomotive and Allied Manufacturers' Association, Lord Chandos proposed the toast "Railway Modernisation." He said he believed in the future of railways, particularly now that our roads were becoming congested. They should offer better service and comfort. Sir Brian Robertson stressed that railwaymen need the equipment to do the job and, in future, they will have it. Finally, the charming toast of "Au Revoir" to delegates was proposed by Sir Leslie Gamage, president of BEAMA.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Voltage Regulator Order

Brown Boveri (Canada) Ltd. have been awarded an $83,040 order for 12 voltage regulators for the Carillon power plant now under construction for Quebec Hydro.

Next Columbia Step

A start on construction of power development projects on the Columbia River seems a little nearer following further discussions in Ottawa a few days ago. The two teams of negotiators, from Canada and the USA, are now to submit a progress report to their respective Governments for approval and this is expected to be the basis of a treaty which may be ratified early next year. According to Mr D. Fulton, who headed the Canadian team, the recommendations took account of the principles agreed upon by the International Joint Commission last December (ELECTRICAL TIMES, 17 Dec., 1959, issue). The Commission agreed on a 50-50 share of downstream benefits, with power production of the American side from storage dams in Canada paid to the latter not in cash, but in power.

SWEDEN

7% Increase

The consumption of electric power in Sweden in the fiscal year, 1959-60, increased by 2,100 million kWh, or 7%, compared with the previous 12-month period, according to a survey by the Swedish State Power Board. A comparison between the calendar years 1958 and 1959 show a rise of only 4·5%, which is considerably less than the estimated annual increase up to 1965, i.e., 6·4% per annum. A revised forecast for the period 1959-65 submitted by CDL, the central operations management of Sweden's power producers, foreshadows an annual increase in industrial consumption of power by 5·6%, as against 4·8% in previous calculations. However, at the same time the annual increase for other consumption, 10%, has been adjusted downwards to such an extent that the overall increase in power consumption remains unchanged at 2,200 million kWh per annum. In its appropriation requirements for fiscal year 1961-62 the State Power Board asks for kr. 260 million (£18,207,000) for the construction of new power stations, kr. 30 million for nuclear development, kr. 40 million for regulation projects and kr. 124 million for network installations. By 1962, the Board says, the building of new stations should have reached such a stage that the resources will be able to cover the requirements, while new stations will be built mainly to meet the annual increase in power consumption.

GREECE

Power Supplies

Some weeks ago we reported that negotiations were in progress on a plan for Turkey to supply some 500 million kWh annually to Greece. We are now informed by Mr J. Flambouriaris, deputy general manager of the Greek Public Power Corporation, that this is incorrect, as no negotiations have been planned or taken place.

INDIA

Load Shedding in Delhi

Replying to a question, the commissioner, Mr P. R. Nayak, told Delhi Corporation recently that for the past two months supply of electricity had been suspended for 20 min periods by rotation in city areas during the evening peak-load hours. The questioner had referred to frequent breakdowns, but the commissioner pointed out that load shedding was deliberate between the hours of 7 p.m. and 9 p.m. The corporation's supply capacity was inadequate to meet demand and the gap was widening and difficulties had been accentuated by the Punjab Government insisting that Delhi should confine its power intake from Nangal to 20 MW. In recent months Delhi had been drawing up to 27 MW. It will be recalled that Delhi suffered a recent power cut owing to a boiler failure.

Plans for easing the electricity restrictions in Delhi include the provision of four thermal 50 MW power stations during the third Five Year Plan period. An allocation of Rs 17·5 crores to the Delhi electric supply undertaking has been recommended. One of the 50 MW stations will be built by the Punjab Government as a standby for Delhi and Rajastan but it will remain under the control of the Delhi supply undertaking.

PAKISTAN

Wire and Cable Plant

The Pakistan Government have approved the establishment of a $6¼ million rod, wire and cable manufacturing plant by the American firm, Phelps Dodge. The plant will roll copper and aluminium into rod from copper-wire bars and aluminium ingots, respectively. Planned to have sufficient capacity to meet the entire requirements of the country, the plant will be built near Karachi and is expected to be in operation within a year.

AUSTRALIA

Third 200 MW Set

A repeat order for a third 200 MW steam turbo-alternator for Vales Point power station has been placed with the English Electric Co. Ltd. by the Electricity Supply Commission of New South Wales. With auxiliary plant manufactured in Australia the contract is worth £A2¼ million. English Electric already have orders for the first two 200 MW sets for Vales Point station, which is being built 70 miles north of Sydney. The steam turbine is of the three-cylinder design arranged in line. Steam temperature at the t.s.v. is 2,350 p.s.i.g. 1,050°F, with reheat at 1,000°F. The feed heating and condensing plants will be made in Australia. The machine is similar to those already in service at the CEGB's High Marnham station.

Street Lighting Subsidy

The New South Wales Minister for Local Government, Mr Hills, is to ask the State Government to subsidise local councils on a £-for-£ basis in a £5 million street lighting improvement scheme extending over the next five years. This is the outcome of the recommendations of the committee set up by the State Electricity Authority to investigate the improvement of street lighting. The committee's survey had found that there was a large deficiency in street lighting along classified traffic routes.

Power Plans for Queensland

Some of the recommendations for meeting power requirements in Queensland over the next 20 years, prepared in a report by the consultants, Merz and McLellan, were revealed recently. They include a 360 MW power station on the Callide coal field in central Queensland, capable of supplying power from Central Queensland to the New South Wales border. Adoption of the recommendations are being deferred until alternative schemes have been investigated. These include plans to use natural gas from Roma, which could possibly be piped to a power station in Brisbane.

Personalities *in the industry*

Mr R. M. Gravett

Mr D. R. S. Turner

Mr A. Hunking

Mr J. F. Bird

Mr R. D. V. Roberts

Commercial officer for No. 3 sub-area of the Merseyside and North Wales Electricity Board, **Mr R. M. Gravett,** M.I.E.E., has been promoted to be the Board's assistant chief commercial officer responsible for industrial development. He succeeds **Mr W. B. Parkinson,** B.SC., A.M.I.E.E., who was promoted chief commercial officer recently (*ESH, pages 136-138). Mr Gravett, who is 58, received his training with the Electric Construction Co. Ltd. and later with the Wolverhampton Corporation. He then joined the Shropshire, Worcestershire and Staffordshire Electric Power Co., moved to the staff of Ealing Corporation as distribution superintendent, and later became deputy borough electrical engineer and manager at Nuneaton. Immediately before joining the Manweb staff on nationalisation, Mr Gravett was electrical engineer and manager for Hoylake UDC.

Commercial manager of the AEI Turbine-Generator Division at Manchester since 1958, **Mr D. R. S. Turner,** B.A., A.M.I.MECH.E., has joined Davidson and Co. Ltd., of Belfast, as a director and general manager. Mr Turner gained his early engineering training and experience with BTH and was turbine sales commercial engineer with that concern from 1946 to 1950, when he was promoted to assistant manager, Turbine Sales Department. Three years later he became assistant general superintendent, Rugby Works, with special responsibility for what was then designated "the Larne project"—the new works of the BTH Co. in Northern Ireland. In May, 1955, he was appointed manager of those works.

Mr J. V. Sheldon has been appointed sales director of Simplifix Couplings Ltd.

Mr L. W. Honey, ASSOCIATE I.E.E., has been appointed to the board of Marryat and Scott Holdings Ltd. He is also joint managing director (Hounslow works) of the subsidiary company, Marryat and Scott Ltd., which he originally joined in 1919. He became chief estimator in 1925, export manager in 1931, a director in 1942, and joint managing director in 1953. He is also managing director of John Bennie Ltd. and chairman of Austin Lifts Ltd., two other subsidiaries.

Mr R. E. Huffam has been re-elected president of the British Standards Institution for a third term of office.

Atlas Lighting Ltd. announce the appointment of **Mr R. A. Bibby** as representative in Northern Ireland. Mr Bibby joined Thorn Electrical Industries Ltd. as a representative seven years ago, covering part of the West Riding of Yorkshire, and later transferred to the Manchester branch.

Mr A. Hunking, B.SC., managing director of Westool Ltd., has been elected to the board of the Warner Electric Brake and Clutch Co., of Wisconsin, USA, whose foreign operations include a wholly owned subsidiary in Switzerland and affiliated companies in France, Germany and Japan. Westool manufacture under licence from the American company the Warner electro-magnetic clutches and brakes. Mr Hunking became managing director of Westool in 1946 and prior to that he was associated with the Federation of British Industries, which he joined in 1928.

A. Reyrolle and Co. Ltd. announce that **Mr J. F. Bird,** M.C., T.D., B.SC., M.I.E.E., has been appointed the company's overseas manager. A native of Newcastle upon Tyne, Mr Bird was educated at the Newcastle Royal Grammar School and at Armstrong College where he gained his B.Sc. degree with first-class honours. He joined Reyrolle's as a student apprentice in 1932 and took up duties with the Technical and Research Department in 1937. After war service with the RA, during which he reached the rank of major and was awarded the M.C., he returned to the company in 1946 and took charge of the Short-Circuit Testing Station until 1949 when he became engineer-in-charge of testing and certification. He was a member of the IEE Council from 1951-53 and, with Messrs Christie and Leyburn, was joint author of a paper on "The Testing of Large Circuit-Breakers" which was awarded an IEE premium in 1955. Mr Bird joined the Overseas Contracts Department in 1954 and, in May, 1955, was appointed manager of A. Reyrolle and Co. (Rhodesia) Ltd., of which company he is also a director. He will take up his new appointment later this year.

British Radio Corporation Ltd. announce that **Mr H. C. Goodman,** assistant sales manager, Marconiphone radio and television, has been appointed sales manager of that Division. Mr Goodman succeeds **Mr Frank Jones** who is retiring.

The Electricity Council have appointed **Mr R. D. V. Roberts** as industrial relations adviser to the Council (*ESH, page 46). Mr Roberts entered the electricity supply industry in 1948 as deputy welfare officer to the then British Electricity Authority, but soon after took up the post of secretary to the National Joint Advisory Council of the electricity supply industry, the body set up under the Electricity Act of 1947 to develop joint consultation in the industry. In 1953 he was additionally appointed as deputy director of welfare to the newly constituted Central Electricity Authority. On the creation of the Electricity Council in 1958 he was appointed deputy industrial relations adviser and, from that post, succeeds Mr D. G. Dodds in his present appointment. Mr Roberts is well known in the field of industrial relations and personnel management in industry and needs no introduction to the many organisations with whom he has worked for so many years. A native of Dolgellau, North Wales, where he was educated at the Dolgellau Grammar School, Mr Roberts proceeded to the London School of Economics where he took the degree of Bachelor of Commerce of the University of London. After some experience as a journalist and editor with a number of publishing firms, Mr Roberts was appointed in 1937 as assistant secretary to the South Wales and Monmouthshire Council of Social Service in Cardiff and later held an appointment as regional officer for the

National Council of Social Service in North Wales. In 1941 he was appointed district officer for the Miners' Welfare Commission in the Northumberland and Durham coalfields and later became the deputy chief district officer of the Commission in London, a post he held till 1948.

Dr T. S. M. MacLean, B.SC., PH.D., A.M.I.E.E., has been appointed lecturer in the Department of Electrical Engineering at Birmingham University.

Four new appointments in their sales-service organisation are announced by Hoover Ltd.: **Mr P. E. Hoskins,** formerly manager of the north west branch at Liverpool, has been appointed branch manager of the south east branch at Romford; **Mr P. R. Goode** has been appointed branch manager of the north west branch at Liverpool in succession to Mr Hoskins (Mr Goode was formerly district manager at Oxford); **Mr R. J. E. Pitman** becomes district manager at Oxford (he was formerly district manager at Cheltenham) and **Mr H. R. Redman** has been appointed district manager at Cheltenham (he was formerly staff instructor at the Bristol Hoover sales-service school).

Professor B. Bleaney and **Dr James Cook** have been appointed members of the Council for Scientific and Industrial Research. Together with a third member yet to be appointed they succeed **Professor P. M. S. Blackett, Sir Eric Ashby** and **Mr H. Douglass,** who have retired on completion of their period of service.

Mr J. E. L. Anderson, M.SC., M.I.E.E., a director of Associated Engineering Ltd. and currently chairman of the IEE Utilisation Section, has been appointed a director and chairman of that firm's subsidiary, Aeroplane and Motor Aluminium Castings.

Mr Hedley J. C. Gower, A.M.I.E.E., assistant to the engineering director of Granada TV, has been appointed chief engineer of Border Television Ltd. He takes up his new duties on 1 Nov.

For a number of years manager of the Brighton branch of W. T. Henley's Telegraph Works Co. Ltd. (now part of the AEI Woolwich Group), **Mr W. G. Turner** has retired, but is to continue to serve in a consultative capacity on the cable side for AEI in the Brighton region. To mark his 50 years' service, he was recently presented with a cheque for £50.

Mr J. C. Reed, formerly sales engineer of Birmingham Aluminium Casting (1903) Co. Ltd., has been appointed sales manager of the company.

Presentations have been made to two officials of the No. 2 area of the Durham Divisional Coal Board who retired at the end of September after a combined service of 90 years in the coalmining industry. The recipients were **Mr W. L. Tulip,** chief engineer for the area, and **Mr James L. Baker,** area electrical engineer. Both officials were with the old Lambton, Hetton and Joicey Collieries Ltd. before nationalisation of the mining industry.

Mr G. H. Thompson has been appointed president of Calgary Power Ltd., of Alberta; **Mr G. A. Gaherty** is chairman of the board. Mr Thompson has been with the company since 1925 and has held the positions of chief engineer, general manager and vice-president.

The Utilities Committee of Winnipeg City Hydro has recommended that **Mr D. C. Bryden** be appointed general manager in place of **Mr T. E. Storey,** who is joining the Manitoba Hydro-Electric Board (not the Power Commission as we reported last week). Mr Bryden, who is now assistant general manager of City Hydro, has been with that undertaking for over three years.

Mr W. J. Thomas, managing director of British Aluminium Co. Ltd. retires on Oct. 31, but will continue to serve as a director of the company and certain subsidiary and associated companies. **Mr J. J. Boex** has resigned as a director and an executive of the company with effect from Oct. 31.

Head of the B.P. Research Centre at Sunbury-on-Thames, **Mr E. S. Sellers,** M.A., M.SC., M.I.CHEM.E., has accepted the invitation to be president of the Junior Institution of Engineers for 1960-61.

As part of a general reorganisation of its sales staff, James Booth Aluminium Ltd. has appointed **Mr Arthur W. Williams,** B.SC., A.I.M., as chief technical representative in charge of the company's technical sales service department.

Mr G. A. Onion and **Mr P. L. Hollings** have been appointed directors of Dowding and Mills Ltd. following the death of **Mr A. E. Hollings,** managing director. Mr Onion is director in charge at the Birmingham works, and Mr Hollings at the London works.

Mr W. S. Lewis, C.B.E., J.P., COM.I.E.E., A.C.T.(B'HAM.) has been re-appointed chairman of the Midlands Electricity Board, to serve up to the end of 1961.

Mr L. J. Gooch, A.M.I.E.E., has been appointed to the board of Marryat and Place Ltd., the electrical contracting company in the Marryat and Scott Holdings group. Mr Gooch was apprenticed to the late Howard Marryat in 1914, became a director of Marryat and Scott Ltd. in 1942 and joint managing director in 1953. It is also announced that **Mr A. J. Bryant,** F.C.A., has become secretary of Marryat and Scott Ltd. on the retirement of **Mr R. Walker** who remains secretary of Marryat and Scott Holdings.

From the London Electricity Board we hear of five new appointments. **Mr R. Thompstone,** ASSOCIATE I.E.E., formerly manager of the West Bourne district, has been appointed to the Board's headquarters as management officer following the retirement, on 30 Sept., of **Mr C. W. Blake. Mr B. L. Wells,** B.SC.(ENG.), M.I.E.E., who was manager of the North Western district, becomes manager of the West Bourne district. **Mr R. C. Tuffnell,** M.I.E.E., manager of the Regency district, becomes manager of the Central district in succession to **Mr G. H. Fowler,** M.I.E.E., who has taken up engineering duties on the chief engineer's staff. **Mr F. N. Sherborne,** A.M.I.E.E., now manager of the South Eastern district, succeeds Mr Tuffnell as manager of the Regency district. The two posts of manager of the North Western and South Eastern districts have yet to be filled (*ESH, pages 76, 77, 78, 81).

Formerly with the London branch sales office, **Mr H. M. Shellard** has been appointed manager of the Nottingham branch office of the Dictaphone Co.

OBITUARY

Mr W. J. Huggett, O.B.E., M.I.MECH.E., A.M.I.E.E., a co-founder of the Express Lift Co. Ltd., died on 5 Oct., aged 78.

Mr A. MacArthur, formerly a director of the International General Electric Co. Ltd., died on 7 Oct.

Mr James Rankin, O.B.E., deputy chairman of the Merseyside and North Wales Electricity Board until his retirement at the end of 1959, died on 9 Oct., aged 68. Mr Rankin, who was a solicitor, joined the North Wales Power Co. Ltd. in 1918 and became its secretary in 1929. From 1940 he was a director and general manager of that concern and Electricity Distribution of North Wales and District Ltd. and general manager of five associated electricity supply companies. He served on many important bodies connected with the industry including the former North Wales and South Cheshire JEA, the National Consultative Committee of the CEB and had been a member of the EDA Council. He was also a member of many committees concerned with the industry's consultative machinery.

Mr W. G. Turner (centre) receives a £50 cheque from Mr F. V. Vaissiere, commercial manager, AEI Cable Division. On left is Mr H. D. Parsons, sales manager, AEI Cable Division

** Denotes revision to the "Electricity Supply Handbook, 1960."*

U.S.S.R. WELDING TECHNIQUES

EMPHASIS on the introduction of new and improved techniques to industry was the impression gained of Soviet welding research by a delegation of British welding experts which visited the USSR. Because of pressure of economic necessity, fundamental welding research was considered to be of secondary importance. Thus research workers in the Union were found to have excellent facilities for constructing prototype production equipment.

Friction Welding

Although automation and mechanisation of processes is the dominant theme in the Soviet welding research programme, a great deal of work has been done on techniques suitable for areas where power supply is limited. Such techniques include friction welding, which is applicable to circular components rotated relative to one another and then brought together by pneumatic or hydraulic pressure. The pressure and the intense local heat generated provide conditions favourable to weld formation. This process is claimed to be more economical in electrical power than flash welding using a transformer.

While welding research in the Soviet Union is of necessity on a much larger scale than in the United Kingdom, in certain spheres as, for instance, inert gas shield welding of aluminium alloys, techniques are not so advanced as in this country. On the other hand, there have been notable contributions to submerged arc welding of aluminium, titanium and copper alloys. Also of interest to the British delegation was work being carried out by the Russians on diffusion welding. In this method, the cleaned surfaces of two components are pressed together and heated in a vacuum, diffusion of metal atoms at the interface producing a weld between the two parts.

The delegation from the British Welding Research Association comprised: the director of research, Dr Richard Weck; the deputy director, Mr H. F. Tremlett; the assistant director, Dr A. A. Wells, and the chief metallurgist, Mr P. T. Houldcroft.

FINANCING ELECTRICITY SUPPLY

SOME of the outstanding subjects of controversy arising from the financial practice of the electricity supply industry are discussed by an Electricity Council deputy chairman, Dr R. S. Edwards, in an article in *Lloyds Bank Review*. He seeks to answer such questions as: do the prices charged for electricity cover the full costs; is there a high enough degree of self-financing; are budgets competently prepared; can electricity investment be adjusted upwards and downwards to help the general economy; is the problem of the peak load being vigorously tackled?

It is not surprising that the answers to these questions are favourable, and that they repeat much that can be read in the recent annual report of the Electricity Council. However, in developing his case, Dr Edwards has some important observations to make on the background to existing policy.

Depreciation and Borrowing

Depreciation provides a case in point. He argues that real costs are covered by the present method of depreciation on an historical basis. This is partly because there are inbuilt margins to take care of rising replacement costs. For example, entire cost is entirely written off over a conservative life, whereas plant in fact has a substantial scrap value, and is sometimes partly paid for by consumer's contributions. Further, due to technological advance, the effective replacement cost is not always rising, as is sometimes assumed; for generation plant overall it has fallen in recent years. Dr Edwards argues that there is no single "right" value of depreciation. What is allowed at present lies well within the acceptable range. Similarly, on borrowing, he feels that the industry pays a sufficiently high rate of interest (currently 6¼%). The supply industry is strong enough to attract capital in any system. It could raise it without Government guarantee and still show a surplus on revenue working. (He excuses himself from discussing whether it would be desirable for the industry to go to the market without the present Government guarantee).

Dr Edwards thinks it unfortunate that the difference between revenue and costs of electricity boards is called the "surplus." To the extent that they are not required to cushion the boards against short-term financial changes, surpluses are "planned as a small contribution from consumers towards development of the boards' undertakings." Nothing is "left over" in the colloquial sense.

Demand and Load

On estimating future demands, the argument is that it matters relatively little if too much plant installation is planned. Such over-provision of new plant could be countered by faster retirement of old plant and calculations have shown that heavy replacement of old plant would be only marginally uneconomic. Under-provision, within limits, can be met by retaining more old plant.

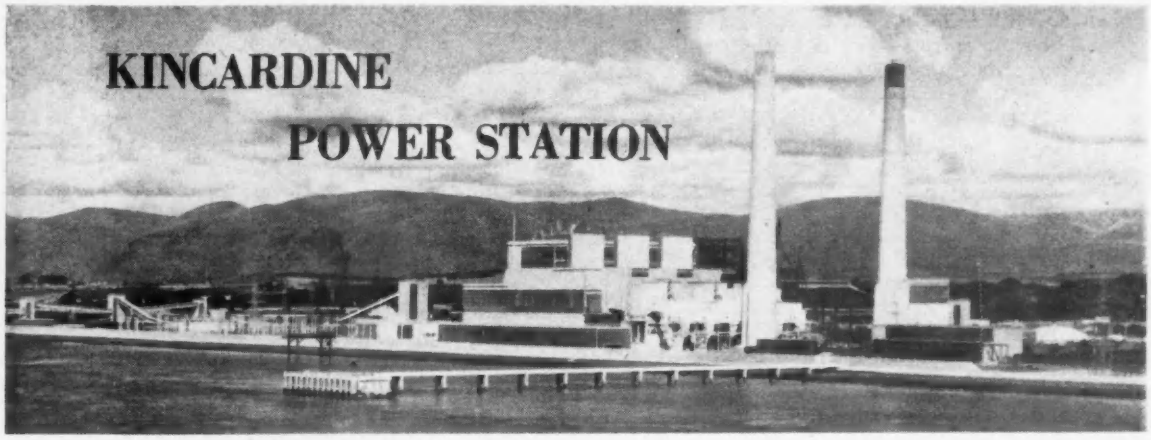
In the case of area boards, the situation is different. Shortage of capital over the years has left area boards with networks in many places seriously inadequate even for present loads. Any unexpected extra demand must be met by immediate capital investment.

This question of adequacy of distribution systems affects the control of supply industry investment by the Government as a method of affecting the economy of the country as a whole. If the Government eases the availability of capital, then the supply industry is one of the first to feel the effects of the change through demands for more supplies by factories and private dwellings. It is not possible to cut back the rate of capital investment for distribution suddenly in such circumstances, unless there is "some fat on the systems first." At present, Dr Edwards comments, "The bones of the distribution networks are almost showing through the skin."

Tariffs

On load factor improvement, Dr Edwards sounds a warning. Speaking on tariff design, he says: "It is important, despite the enthusiasm for low unit charges in retail tariffs, to ensure that they are kept slightly above marginal costs. It is necessary to avoid slipping into the position where increasing volume of business results in lower rather than higher surpluses."

KINCARDINE POWER STATION



A NOTABLE occasion for the electricity supply industry in Scotland was celebrated yesterday when Her Majesty The Queen opened Kincardine power station. Estimated cost of the completed station, at £36¼ million, ranks it as one of the largest engineering projects in Scotland in the last 15 years. Kincardine, with its ultimate installed capacity of 760 MW, will provide about half the electricity requirements in Scotland when it is completed in 1963. The station will make a major contribution to the SSEB programme, for its three 120 MW sets represent 20% of present installed system capacity and the two 200 MW sets under construction almost half the total new plant programme to 1966.

Kincardine is more fortunate than most power stations in its siting. It has the sweep of the River Forth in its foreground, while the distant Ochil Hills help to soften the skyline.

Station Construction

A light cladding of aluminium and glass with a brick lower portion has been used for main and ancillary buildings. In the turbine house, the first three sets are arranged transversely but, because of their length, the fourth and fifth 200 MW sets will be placed longitudinally. The well-planned station interior, with its varied colour schemes, gives an immediate impression of lightness and space while maintaining a compact plant construction.

The boiler house lies to the east of the turbine house, separated from it by an annexe containing feed pumps, deaerators, reserve tanks and boiler/turbine control rooms.

Boiler and turbine controls for sets 1 and 2 are located in one room, with a separate control room for the third set. Eventually, a third control room will house the controls for sets 4 and 5.

Also on the east side are the milling plant, precipitators, chimneys and ash-handling plant. On the west side of the turbine house are the switchgear compounds and transformer annexes and overlooking them the electrical control room.

The station has three 120 MW sets in operation. Two of these were commissioned in December, 1958, and September, 1959, while the third was brought into service last August. The two 200 MW sets, with advanced steam conditions, will complete the station by 1963.

The station site was reclaimed from the river in about 1882 and covers 150 acres; 137 acres are occupied by the station and its ancillary buildings, switchyards and railway sidings. The site is below high-water level and an embankment provides protection against flooding. Additional protection is afforded by four 6,000 g.p.m. pumps, which start up automatically when the level in an underground surface-water reservoir rises unduly.

Fig. 1. Above, a general view of the station from Kincardine Bridge over the River Forth

The site has a good access road linking with the main Kincardine-Alloa road and the fine river bridge. However, the station is designed to be supplied by rail-borne coal and its coal-handling plant can deal with 375 wagons/day, with an annual tonnage of 2,200,000. Facilities include two side-discharge tipplers for 24½-ton wagons and three filler pits for hopper-bottom wagons. The plant has provision for vibrating the wagons to dislodge coal and equipment for reducing dust nuisance. Duplicate 600 ton/hr conveyors, remotely controlled, take the coal to a central point from which it may either be distributed on the stock pile by 1,200 ton/hr conveyors or screened and crushed before being taken by one of two further 600 ton/hr duplicate conveyors to the boiler bunkers.

Boiler Plant

Three boilers supply the 120 MW sets, but No. 1 differs from Nos. 2 and 3 in being of International Combustion manufacture and in some different constructional features.

No. 1 boiler has five coal-pulverising mills of the suction type with rollers running on a grinding ring. Four of the mills will provide full load boiler capacity. They are driven by 200 h.p. 415 V constant speed motors and 275/77 h.p. 415 V Laurence Scott variable speed motors drive the exhauster fans which deliver the fuel to the boiler.

Nos. 2 and 3 boilers have four high-speed horizontal-spindle attrition pulverisers consisting of a combined mill and exhauster. The mills are driven by constant speed 600 h.p. Lancashire Dynamo motors, and three mills are capable of meeting full load.

All three boilers are designed for full load of 860 klb/hr with feed at 446°F superheater outlet at 1,600 lb/sq in. 1,010°F, and provide reheat to 1,005°F for 758 klb/hr steam. The boilers are of the natural circulation, water-tube type with radiant water-cooled combustion chambers designed to burn pulverised coal with an average calorific value of 9,400 B.Th.U/lb, and an ash content of up to 20%.

No. 1 boiler has the fuel fed to four tilting burners located at the corners of the combustion chamber and arranged for tangential firing. Superheater outlet temperature is controlled by spray-type desuperheaters between the primary and secondary sections of the superheater, while reheat outlet temperature is controlled by adjusting the burner tilt angle.

Nos. 2 and 3 boilers were built by John Brown Land Boilers. They differ from No. 1 in having the first section of the secondary superheater in the radiant zone at the top of the front wall, and in the form of platens suspended from the combustion chamber roof. A further section, in the convection zone, is followed by the primary superheater and reheater arranged in parallel gas paths before the economiser. These boilers have 16 burners in the front wall of the furnace.

All boilers have Lodge-Cottrell twin electrostatic precipitators preceded by Howden mechanical collectors. The precipitators are of the "catch pocket," horizontal flow type with rapping gear running at different speeds so that re-entrainment of dust particles is avoided. The precipitators have three banks of series electrodes energised at 50 kV d.c. and are designed to deal with up to 394,000 c.f.m. of gas at 280°F, with a precipitation efficiency of 99%.

Gases from these three boilers are exhausted to the first of two 400 ft-high brick chimneys having an internal diameter at the top of 24 ft. A second chimney will serve the 200 MW units.

Air is delivered to No. 1 boiler by two f.d. fans through two rotary regenerative heaters. Two outdoor induced-draught fans exhaust the gases from the precipitators to the chimney. The f.d. and i.d. fans are driven by Bruce Peebles induction motors, rated 495 h.p. and 1,017 h.p., respectively, through hydraulic couplings. On Nos. 2 and 3 boilers a similar arrangement is used. Both f.d. and i.d. fans are driven by constant speed motors through hydraulic couplings. The motors, built by AEI (Manchester), are rated 440 h.p. for the f.d. and 835 h.p. for the i.d. fans, respectively.

Feed and Circulating Water

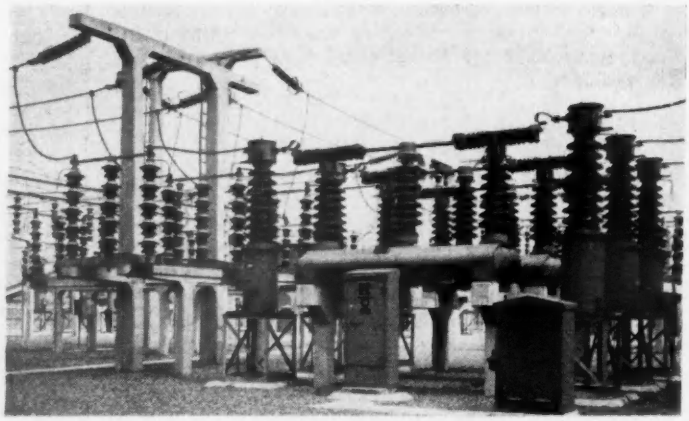
The boiler feed system used for No. 1 boiler again differs slightly from that used on Nos. 2 and 3. Condensate from the main condensers is delivered by extraction pumps through two low-pressure heaters to a high-level deaerator. Mather and Platt booster feed pumps then raise the condensate pressure to 550 lb/sq in. before it enters three high-pressure heaters. Leaving these heaters at 435°F, the feed pressure is further raised to 1,950 lb/sq in. by the main boiler feed pumps. Mather and Platt supplied the three 50% duty booster and h.p. feed pumps and their motors. These pumps are designed to deliver 483 klb/hr. The four-chamber booster pumps are driven by 415 h.p. 6·6 kV two-pole double-squirrel-cage induction motors and the 11-chamber h.p. pumps, generating a head of 3,980 ft, are driven by 1,300 h.p. 6·6 kV solid squirrel-cage rotor water-cooled induction motors.

Boilers 2 and 3 have a single stage of h.p. feed pumping positioned before the high-pressure heaters. Six −50% duty, 10-stage pumps and motors supplied for this duty by Harland Engineering deliver 485 klb/hr at 260°F against a pressure of 2,005 lb/sq in. They are driven by 1,650 h.p. 6·6 kV water-cooled squirrel-cage motors.

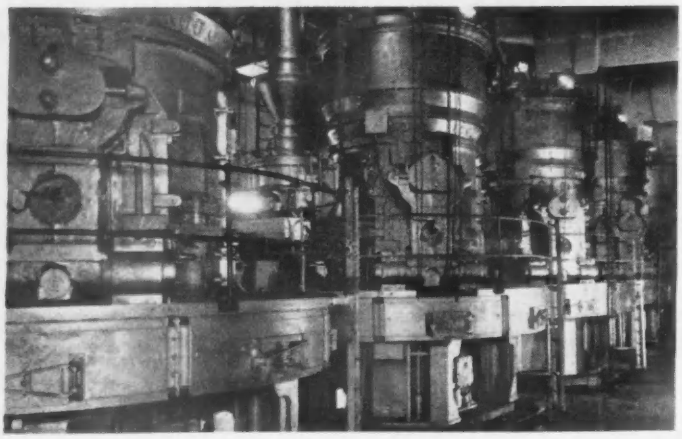
Circulating water for the condensers is provided from the River Forth by four 65,000 g.p.m. vertical-spindle centrifugal pumps driven by Bruce Peebles 1,025 h.p. 6·6 kV motors. Because the River Forth at this point is tidal, cooling water is taken from a headwork 500 ft off-shore near the river bed and discharged on the surface about half a mile upstream from an outfall on the bank.

Turbines

The three Parsons 120 MW turbo-generators are designed for steam conditions of 1,500 lb/sq in. 1,000°F, with reheat to 1,000°F at 365 lb/sq in. between the h.p. and i.p. sections. The turbines have three cylinders and three exhausts and run at 3,000 r.p.m. Reaction blading is used throughout, except for a two row impulse wheel at the h.p. inlet. Each turbine has three sets of l.p. blading, achieved by incorporating in an extension of the i.p. turbine low-pressure blading similar to the l.p. turbine.



▲ *Fig. 2. A general view of the 132 kV switchgear compound. The switchgear installation for the first three 120 MW alternators consists of 15 air-blast circuit-breakers rated 3,500 MVA 132 kV. A further six breakers for 275 kV 7,500 MVA will be installed in an adjacent compound to serve the two 200 MW sets when they are completed*



◀ *Fig. 3. The five pulveriser mills for No. 1 boiler are of the Lopulco type and are driven by 200 h.p., 415 V motors. Four mills are capable of meeting boiler full load requirements*

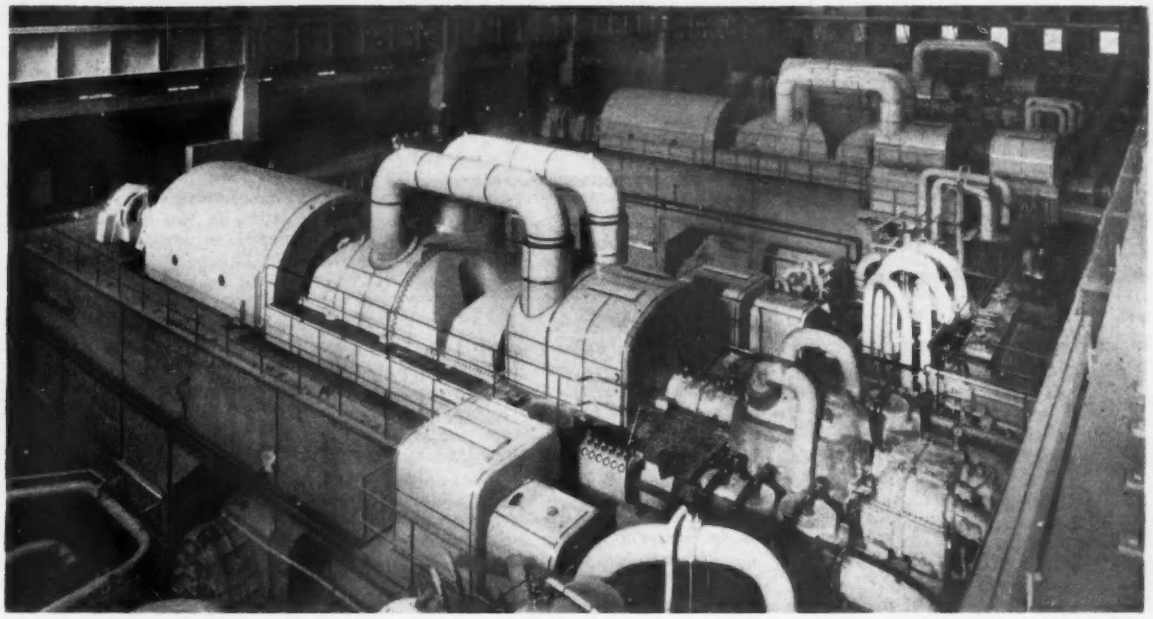


Fig. 4. Layout of the turbo-generator house showing the three 120 MW sets now in service. The 200 MW sets will be on the right

Double shell construction is used for the h.p. and l.p. turbines and the h.p. cylinder is reversed to minimise thrust.

To allow for stored energy in the reheat system, emergency control is supplemented by an auxiliary governor, independent of the main governor and by intercept and release valves. The intercept valves, normally open, close under control of the auxiliary governor at a set overspeed. Steam from the reheat system and h.p. cylinder is then passed by the release valves to atmosphere.

Exhaust steam, for heating feed water to 435°F, is tapped from the machines at six points. Each turbine has a two shell condenser producing a vacuum of 28·9 in Hg and having a total surface area of 70,000 sq ft designed for a cooling water circulation of 60,000 g.p.m. One shell handles two-thirds of the steam derived from the i.p. and l.p. exhaust, while the other shell is coupled to a second exhaust on the l.p. cylinder. Cathodic protection is used.

Generators, Unit Transformers and Switchgear

The generators are rated 120 MW at 0·85 p.f. 13·8 kV. A two-part construction has been adopted for the stator to facilitate transport. An inner part, consisting of core and windings, is housed in a separate outer casing containing ducts for the hydrogen cooling system and the four hydrogen coolers which are mounted on the top half of the casing. Rotors are of the direct gas-cooled type with fans to circulate the hydrogen which is maintained at a pressure of 15 lb/sq in.

Each generator has a main and pilot exciter driven from the rotor shaft through reduction gearing at 1,000 r.p.m. with excitation control by the AEI amplidyne system. The exciters are cooled by a filtered air circuit.

Busbars in trunking link the three generators to their outdoor generator transformers. These transformers were built by Bruce Peebles and are rated 144 MVA 13·2/145 kV. They are of the OFW type and have 14 steps of on-load tap changing giving a range of ±10%.

The generator transformers are linked to the 132 kV switchyard through oil-filled cables. The switchgear for the first three sets comprises 15—132 kV air-blast circuit-breakers built by AEI (Manchester) and rated 3,500 MVA.

The main plant auxiliaries are supplied by 3—11 MVA 13·8/7 kV unit transformers made by Bonar Long. Other auxiliaries are energised from two 15 MVA 132/7 kV AEI station transformers and two 20 MVA starting transformers, each having high-speed resistor transition on-load tap changers with 14-1·43% steps.

The main auxiliary switchgear is of the English Electric 6·6 kV air-break type and is located with Whipp and Bourne 415 V switchboards in two annexes running the length of the turbine house.

The main electrical control room is located centrally in the turbine house annexe and houses controls and indication for all 132 kV circuit-breakers and 6·6 kV auxiliary feeders.

The consulting engineers for the station were Messrs Kennedy and Donkin in association with the civil engineers, Jas Williamson and Ptnrs. The architects were Robert Matthews and Johnson-Marshal.

PRINCIPAL CONTRACTORS

Main civil engineering	Holloway Bros. (London).
Structural steelwork	Redpath, Brown.
Lifts	Keighley Lifts.
Riverworks and site main drainage	Yorkshire Hennebique.
Brick chimney	P. C. Richardson.
Ash disposal and civil works	Mowlem (Scotland).
No. 1 boiler, milling and oil fuel lighting-up plant	International Combustion.
Nos. 2 and 3 boiler controls	John Brown Land Boilers.
Sootblowers	Ivor Power Specialty and Clyde Blowers.
Air heaters, i.d. and f.d. fans and mechanical collectors	Jas. Howden.
No. 1 boiler i.d. and f.d. fan motors and generator transformers	Bruce Peebles.
High-pressure valves and mountings	Hopkinsons.
Electrostatic precipitators	Lodge-Cottrell.
Automatic boiler controls	Bailey Meters and Controls.
Milling plant	Craven Bros.
Nos. 2 and 3 boilers, i.d. and f.d. fan motors, station transformers, and 132 kV switchgear	A.E.I. Ltd.
Turbo-generators, condensing plant, feed water heaters, air ejectors and heat exchangers	C. A. Parsons.
Deaerators	G. and J. Weir.
No. 1 boiler feed pump and motor	Mather and Platt.
Nos. 2 and 3 boiler feed pump and motor	Harland Engineering.
Circulating water pumps and motors	Drysdale.
Circulating water screening plant	J. Blakeborough.
Auxiliary pumps	Mirrlees-Watson.
Coal handling plant	Simon-Carves.
Auxiliary electric motors, 6·6 kV switchgear	English Electric.
Ash handling plant	J. Thompson Industrial Construction.
Cabling and lighting	Jas. Scott.
Auxiliary motors	Lancashire Dynamo.
h.p. and l.p. steam and feed pipework and valves	Aiton.
Unit and starting transformers	Bonar Long.
Auxiliary transformers	Watford Electric and Bryce.
415 V auxiliary switchgear	Whipp and Bourne.
Contactor gear	M. and C. Switchgear.
Main generator connections	South Wales Switchgear.
Telephones	S.T.C. Communication Systems.

for the electrical trade

Luxury cooker at popular price

THOUGH inexpensive in comparison with "luxury" cookers, GEC's new "Treasure," at only £48, embodies a number of features usually associated with higher-priced models. It has an eye-level grill controlled by a three-heat rotary switch, an inner glass door on the oven and a separately heated plate-warming drawer. Two of the three plates are 7 in. "Superspeed" radiant rings of 2,100 W loading, each controlled by simmer switches, the other a new solid cast iron 1,000 W boiling plate of 5¼ in. with three-heat control.

All five element control switches are placed in a line above the oven, on a neat panel which also carries the neon oven pilot light. This model is available with a time control for the 2,600 W oven, in which case the selecting dial is placed on the top right-hand corner of the splash plate. Finished in white or honeysuckle vitreous enamel, "Treasure" measures 36 in. in height to the hob and 54¼ in. to the splash plate. It is 21¼ in. wide and 22¼ in. deep. Total loading, 10,035 W; D763, £48; time-controlled model, D765, £52. *General Electric Co., Magnet Hse, Kingsway, W.C.2.*

B.C. holders for bi-pin fittings

IN order to ease the changeover to bi-pin fluorescent fittings where users still hold stocks of b.c. lamps, manufacturers of "Taskmaster" and "Litemaster" bi-pin fluorescent fittings have evolved a special b.c. lamp holder which fits the existing channel. The problem was to produce a holder for b.c. connection within the same overall dimensions as the bi-pin. It has been solved by the use of a pedestal-type holder in which plunger contacts are incorporated into a piston mounting. This piston sinks into the pedestal to allow for tolerances in lamp length as well as for insertion of the cap, whilst its springs exert the pressure necessary to grip the lamp in position. Catches on the lamp are accommodated by entry slots, one of which embodies the cap-earthing contact. Lamps can be removed from these holders from one end. For double-lamp fittings, two holders are employed at each end, mounted on angled supports. List prices are 8s single holder and 18s double. *The Benjamin Electric, Brantwood Rd, Tottenham, N.17.*

Anti-frost pipe protector

A SMALL heating unit is available for preventing indoor water pipes from freezing. Known as "Negra," it comprises a 60 W heating unit housed in a black plastics case, flex connection and two-pin plug. It is intended for fixing to a vertical indoor water pipe and is said to protect 25 ft of pipe whilst outside temperatures are anything down to −10°C or −12°C. "Negra" is produced by the German manufacturers Graf and Ravisini. Distributors: *Barward Equipment Co., 5 New Quebec St, W.1.*

Stylish new iron

ELEGANCE is the keynote of Metway's new electric iron, "Ritzway." It is slimly fashioned, following the current trend, and has a newly designed handle. The iron embodies several interesting features, notably the soleplate of stainless steel. The earlier "Dualway" travelling iron also had a soleplate of this material and the manufacturers have claimed on both occasions that it is a feature exclusive to their range. A thoughtful detail is in the flex connection; here a short rigid sleeve holds the cable horizontal to the table, but may be fixed to point in any direction to suit right-handed or left-handed users. An indentation in the toe enables the user to iron under buttons without tearing them off. "Ritzway" has a chromium plated top, the usual pilot light on the handle and is thermostatically controlled by a fabric selection wheel. It is said to be completely stable when rested back on its heel. Embedded type element has a 600 W rating. Price, £3 15s 10d, tax paid. *Metway Electrical Industries, Metway Wks, Canning St, Brighton 7.*

GEC's new cooker, "Treasure," the time-controlled Model D765 at £52

The new contemporary styled "Ritzway" iron, £3 15s 10d

TRADE PUBLICATIONS

ZIRCONITE.—Leaflet on machinable refractory for 1,700°C plus from W. and C. Spicer Ltd., The Grange, Kingham, Oxon.

CIBA.—Technical Notes 213 for Sept., 1960, on Radio-frequency Heating, Part I. From the Technical Service Dept., CIBA (A.R.L.) Ltd., Duxford, Cambridge.

VERITYS.—Leaflet on Orbit, Junior, Malabar and Karachi fans from Veritys (Fans) Ltd., 64 Essex Rd, N.1.

REAL.—Abridged price list and catalogue of lighting equipment. Rowlands Electrical Accessories Ltd., REAL Wks, Hockley Hill, Birmingham.

TERYLENE.—Industrial buyer's guide, Part 6, Electrical and Miscellaneous Products. I.C.I. Ltd., Fibres Division, Hookstone Rd, Harrogate, Yorks.

EDMUNDSONS.—New lines supplement and revised price list of electrical appliances catalogue for 1960 by Edmundsons Electrical Wholesalers Ltd.

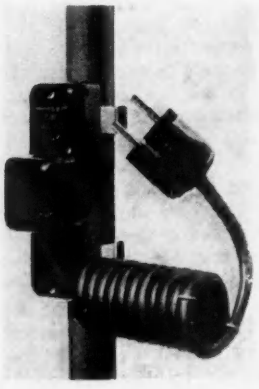
UNITY.—28-page brochure on heating units and central heating under Floor-warmth trade mark. Unity Heating Ltd., Chilworth Manor, Southampton.

BEULAH.—Eight-page technical leaflet on test equipment from Beulah Electronics, 138 Lewisham Way, New Cross, S.E.14.

NIMONIC.—"Developments in Nimonic Heat-resisting Sheet Alloys," a four-page leaflet. Henry Wiggin and Co., Wiggin St, Birmingham 16.

CIRCOMATIC.—15-page illustrated brochure on the new seam-welding machine giving details of welding for storage tank construction, also specification of machine, by Rockweld from Commercial Editorial Services, Creed La, E.C.4.

EMIDEC 1100.—Large technical brochure illustrating applications of electronic computers for commerce and industry. E.M.I. Electronics, Hayes, Middx.



"Negra," a 60 W heater for preventing water-pipes from freezing

equipment for industry

High capacity plug and socket

CONSTANT low contact resistance is claimed for a new type of plug and socket now available in this country. The principle employed is that the plug pins are made up of a bundle of specially manufactured spring strips arranged cylindrically. The total contact area is thus theoretically the sum of the areas presented by the individual strips, the pins being effectively spring-loaded. A more even distribution of contact area should thus be achieved than with a badly machined solid pin with a consequent elimination of hot spots. It is claimed that although the plug-in force required is negligible, the design ensures excellent security against vibration. These plugs make up the "ODU" range manufactured in Germany and cover a wide variety of types up to a maximum current-carrying capacity of 30 A. *Arthur E. S. Matthews Ltd., 36 Victoria St, S.W.1.*

Compact transistor valve voltmeter

INCORPORATING a compactly housed four-stage transistorised amplifier and bridge rectifier, the "ADVAC" VM77 a.c. valve voltmeter is suitable for amplifier and general voltage measurements. Readings can be made from 100 mV to 300 V a.c. in 12 ranges covering frequencies 10 c/s to 5 Mc/s. The 3 in. anti-parallax scale is calibrated in volts r.m.s. and dB, support bipods being provided to facilitate viewing. Accuracy of measurement claimed for this instrument is ±3% f.s.d. between 15 c/s and 2 Mc/s and ±2 dB from 2 Mc/s to 4·5 Mc/s, readings being close to r.m.s. even with an input having fairly high harmonic content. *Advance Components Ltd., Roebuck Rd, Hainault, Ilford, Essex.*

Thermistor bridge thermometer

A THERMISTOR bridge circuit is used in the construction of an industrial thermometer capable of giving quick and accurate temperature readings. Although the standard probe is designed for surface temperature measurement it can also be immersed for the temperature measurement of many liquids. Alternative probes are available for gas temperature measurement. The instrument is the "MIP Thermeter" of which there are two types, one being for a temperature range −40°C to 10°C, the other for 10°C to 110°C. An anti-parallax scale is incorporated and the time taken to make a reading is approximately 15 sec. Powered by a Reubens/Mallory cell, the compact, lightweight and rugged construction of this instrument should make it suitable for a wide range of applications, particularly in metal-rolling mills, air-conditioning systems and branches of the chemical industry. *Measuring Instruments (Pullin) Ltd., Electrin Wks, Winchester St, Acton, W.3.*

Miniature mains plug and socket

A 3-PIN 1 A miniature mains plug, type L.1436/P, has been introduced having overall dimensions 1·031 in. by 0·703 in. by 0·875 in. The virtually unbreakable body is of black nylon with shrouded silver-plated pins, a notable feature being the transparent nylon cover facilitating terminal inspection. Cable sizes of up to ¼ in. dia can be accommodated by the grip and the plug is designed to disengage without damage should the cable lead be accidentally jerked. Supplied with the plug is a 1 A socket-outlet, L.1436/S. This is for panel mounting by means of a single lock-nut and has a fully shrouded phenolic body, the sockets being of silver-plated beryllium copper. *Belling & Lee, Great Cambridge Rd, Enfield, Middx.*

Shaded-pole small motor range

SUITABLE for powering light equipment such as fan heaters, office machines and cine-projectors, a range of shaded-pole motors has been announced comprising 12 models. These give output torques from 1·24 oz in. to 7·2 oz in. continuous or intermittent rating, for supply voltages up to 250 V and frequencies 50 or 60 c/s. Known as "P" type motors, skeleton frame construction is employed and dimensions are standardised to the extent that four armature core lengths and two shaft diameters cover the entire range. *Limit Engineering Group Ltd., 64 Essex Rd, Islington, N.1.*

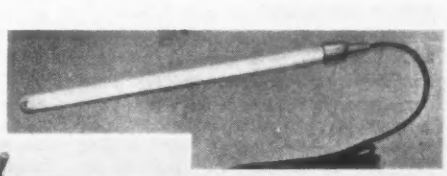
Corrosive liquid immersion heater

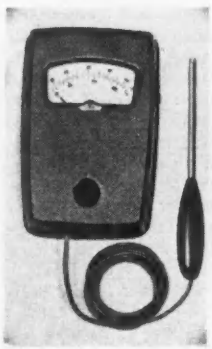
A CONVENIENT method of electrically heating corrosive or semi-corrosive chemical solutions is provided by the "Red-Rod" immersion heater. This has its heating element sheathed in quartz which is immune from attack from most liquids liable to be encountered with the exception of concentrated caustic alkali, hydrofluoric and phosphoric acids. The quartz sheath will withstand violent thermal shock and will thus remain undamaged even if plunged at red heat into cold water. The heater unit is available in two diameters (½ in. average), lengths varying from 10 in. to 14 in. at ratings 300, 400 and 500 W. Standard voltages are 100 to 120 V, 200 to 220 V and 230 to 250 V. The device should be particularly useful for chemical laboratory work. *Electrothermal Engineering Ltd., 270 Neville Rd, E.7.*

Unit construction multi-pole m.c.b's

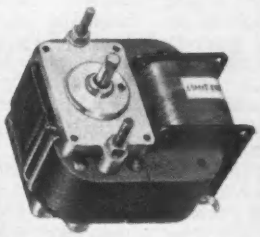
CONSISTING of double- and triple-pole units, a range of miniature circuit-breakers is available for currents from 5 A to 60 A at 440 V a.c. and 250 V d.c. These extend and, in fact, are built up from the original "Midget" range of single pole units. Tripping mechanisms are linked internally and simultaneous tripping is ensured by utilising a specially shaped contact arm. The operating mechanisms are linked externally. These units should find application in the protection of wiring installations in shops, offices and factories. *The M.C.B. Co. (Manchester) Ltd., Lupus Wks, Oxford Rd, Altrincham, Cheshire.*

Red-Rod immersion heater with quartz sheathed element for corrosive liquids

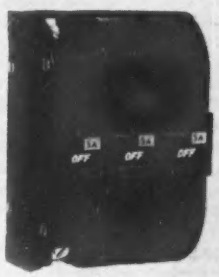




Pullin thermistor bridge industrial thermometer



Typical shaded pole motor in the new range developed by Limit Engineering for small fan and similar drives



Unit construction multi-pole m.c.b. by the M.C.B. Co

Low-priced test meter

A MULTI-RANGE test meter claimed to have good accuracy, high-quality construction and durability is available in two models with the more sensitive version priced at £6 10s. This meter has seven d.c. and four a.c. voltage ranges from 0·5 V to 1 kV, four resistance ranges up to 20 megohm and four d.c. ranges from 0·1 to 250 mA. Accuracy on the a.c. ranges is claimed as ±3% and ±2% on the d.c. ranges. The meter measures 5¾ in. by 3¾ in. by 2¼ in. and is of foreign manufacture. The less sensitive model is slightly smaller, has five a.c. and d.c. voltage ranges, two resistance ranges and three d.c. ranges up to 250 mA. Sensitivity is claimed as 2,000 ohms per volt. *Household Electrix Ltd., 47 High St, Kingston-on-Thames, Surrey.*

Polythene tape

IN the note on Rotunda tape, which was published in "Equipment for Industry" in the ELECTRICAL TIMES of 11 Aug., some confusion occurred regarding the properties of the various tapes described. Polythene-based self-amalgamating tape, with which our note was mainly concerned, is a mixture of polythene and self-amalgamating rubber. It is claimed to have excellent electrical properties, and to be resistant to ozone, as well as being extensible. The tape has good resistance to water vapour, corrosive atmospheres, dilute acids and alkalis, but is attacked and softened by oils, greases, fats and certain solvents.

No special claims are made for the mechanical strength of this tape, and the manufacturers recommend that in use as an electrical insulating tape it should be finished with an outer wrapping of p.v.c. plastic adhesive tape. This gives the desired mechanical strength and some measure of protection against attack by acids, oils and solvents. The general properties of the polythene-based self-amalgamating tape are given in the earlier part of our August note. *Rotunda Ltd. Denton, Manchester.*

Motor timer unit

INTRODUCED for the control of industrial processes, space heating and domestic appliances, the HR timer unit incorporates a single-phase synchronous motor which drives the switching contacts. The timer can open or close as many as 12 external electrical circuits in timed sequence, the particular sequence being specified in advance and set by the makers. A knob on the dial is turned until a pointer indicates the total timing period required. The pointer returns to zero during the timing period and the motor is then cut out. The standard model of this unit is fitted with two changeover snap-action switches having a capacity of 5 A at 230 V a.c. for supply voltages 400 V to 440 V or 200 V to 250 V at 50 c/s. Timing ranges between 0-30 sec and 0-7 days can be provided as required. The timer body is 3⅛ in. diameter and is for panel mounting. *Electrical Remote Control Co. Ltd., The Fairway, Bush Fair, Harlow, Essex.*

Cheaper time keeping

PARAMOUNT claims for the recently announced "Minipulse" clock system are the compactness of the master and slave units and their relatively low cost. The low price of the units is expected to make them competitive with foreign built time keeping systems without sacrifice either of quality or performance. The system uses a movement which is claimed to be unique, operating on a pulse system. One pulse per minute is transmitted to each of the slave clocks which may number up to 50 with the basic circuitry. If, however, additional operating relays are included the number of dials may be increased. The small movement required for the slave units has two advantages, it is sufficiently small to be mounted behind the clock bezel without the need to cut recesses in the mounting wall, and use of what is termed a "reverse polarity" control eliminates ratchets and pawls, so ensuring inaudible operation.

The master clock is relatively small, and is compensated for temperature variations. A wide selection of slave dials are available and special clocks for executives' rooms and other important locations are custom built. In conjunction with the "Minipulse" system, a programme unit can be used to operate bells and other warning or timing signals. *Minipulse Clocks Ltd., Clutha Hse, 10 Storey's Gate, S.W.1.*

TIME AND INSULATION

Mr C. G. Garton's Address

MUCH more is demanded of insulation in many electronic applications than was required in earlier uses for electrical power equipment. This is so especially with regard to temperature and reliability. This theme was developed by the chairman of the IEE Measurement and Control section, Mr C. G. Garton, M.I.E.E. (ERA), in his inaugural address delivered on Tuesday.

New requirements for working temperature varying from the extreme cold that may be experienced in a satellite to the high temperature of nuclear reactors. In the latter field, pump motors have already been required to operate with windings immersed in a liquid at 450°C, while temperatures of 1,500°C are envisaged.

Another relevant factor in considering insulation today is the extreme complexity of some electronic apparatus. The number of components in a large computer may be of the order of a million, so if the probability of failure in any given component were as great as once in 20 years, and failures occurred at random over this period, operation of the computer would be interrupted every few minutes.

To meet this situation, the insulation engineer cannot rely on conventional tests and knowledge of insulation behaviour which have served for less stringent requirements. It is important that he should develop ways of thinking about insulation which give an intuitive feeling for the behaviour of matter at temperatures and over long periods which are outside the range of direct human experience. For example, the h.v. capacitors in submarine telephone cable equipment require an average life of about 10,000 years in order that no single one shall fail within the 30 years' life of the cable. On the other hand, a process of deterioration which may take thousands of years to complete at the temperature of sea water may take place in a few seconds if the temperature is raised to 400°C.

Rate Processes

Mr Garton suggests that there is a unifying concept which makes it easy to understand the great dependence of insulation properties on temperature. This is the concept of the "rate process." He approaches it by considering why chemical or physical processes, which it is known will reach completion after a longer or shorter time, do not go to completion instantly. The reason is that atoms or molecules in any system which is not in an extremely rapid state of change, occupy the position which they do because they have found at least temporary positions of minimum energy in the structure.

The atoms or molecules cannot leave these positions until by some means they acquire sufficient energy to pass over an energy barrier to a new position of lower energy than the first one. Since most external causes of energy change such as an electric field or moderate mechanical stress cannot supply anything like this amount of energy to an individual molecule, the only occasion on which the molecule can make the transition described above is when it receives by chance an altogether exceptional proportion of the random thermal agitation which is distributed throughout the system.

This idea can be expressed mathematically by saying that the rate of change in a simple rate process is governed by a characteristic time.

$$\tau_0 = \tau_0 \exp(W/kT)$$

where τ_0 is constant, W is the energy required to enable a molecule to make a transition, and kT is the thermal energy which at room temperature is about 0·025 eV. This simple equation underlies nearly all the changes, electrical, mechanical and chemical to which insulation is subject.

News of the Week

MAJOR WAGE RATE CHANGES FOR ELECTRICIANS

ONE shilling per hour extra for journeymen electricians applicable from 1 Jan. next, revised overtime rates, and a standstill agreement on wage rates for 2½ years dependent on not more than five points movement in the cost of living index, are outstanding features of a new agreement between the NFEA and the ETU announced on Tuesday.

Under the new agreement, the wage rates for journeymen electricians in the contracting industry will be: London, 6s 6½d/hr; Provinces, 6s 2d/hr; Mersey area, 6s 5d/hr. There are to be corresponding adjustments for other classes of employee. These will be the new inclusive hourly rates of pay.

The NFEA and the ETU have agreed that the rates specified are to remain in operation for a period of 2½ years, except that if the cost of living figure changes more than five points from its value at Dec., 1960, the NFEA may apply for a change in rates if the figure goes down, or the ETU may apply if the figure goes up.

As from 1 Jan., 1961, all payments made on any job throughout the country under clause 12 of the National Agreement ("work under abnormal conditions") or through NJIC or area JIC awards, or through site agreements, will cease to operate, with only two exceptions: the provisions of clause 12 relating to collieries and stationary accumulators.

Overtime rates as from 1 Jan., 1961, are to be changed to the following: For the first two hours in excess of normal, time-and-one-third. For any subsequent overtime time-and-a-half. After four hours the rate for the next two hours will be time-and-two-thirds. Thereafter and until the beginning of the following day shift, double-time.

Overtime for Saturday work in respect of 5½-day operatives will be: the first two hours after normal morning work, time-and-one-third; thereafter until midnight, time-and-a-half. In respect of five-day operatives, the first two hours of Saturday work, time-and-one-third; and thereafter time-and-a-half until midnight. The part of Clause 8 of the National Working Rules which states that payment of more than the standard rate is not prejudiced by that section of the agreement, is altered by having words added that make it clear that such payment "is at the sole discretion of the employer."

This agreement, of course, applies to the 42-hour week to be worked in the electrical contracting industry from 1 Nov. next. That agreement pledged both NFEA and ETU to co-operate in securing full utilisation of hours of work and achievement of maximum output and elimination of time wasting.

Kenwood in Midlands

NEW premises have just been completed for the Kenwood group of companies at Berry Hill, Droitwich. It comprises a 3,600 sq ft office block, a 6,000 sq ft warehouse and service workshop and includes a demonstration theatre for staff training and a permanent showroom. The warehouse will be the national distribution centre for Kenwood products.

South Scotland Board's new charges

DETAILS of cuts in their off-peak tariffs (to which we referred on 22 Sept.) have now been given by the South of Scotland Electricity Board. For medium voltage supplies the reduction is of 0·05d p.u., making each of the three rates 0·75d, 0·8d and 0·85d. For h.v. supplies a reduction of 0·04d p.u. brings the rates to 0·73d, 0·78d and 0·83d, respectively. The afternoon restricted hours are also amended for tariffs 1 and 2.

These changes apply from 15 Nov. as do increases in the m.d. tariffs just announced by the Board. Under these, each step of the m.d. charge is raised 3s and for h.v. supplies the unit charges are increased to 0·9d, 0·8d and 0·7d; and for m.v. supplies, 0·92d, 0·82d and 0·72d, respectively, but the fuel adjustment rate goes to 90s and, in effect, will reduce the charges (see page 546).

RECEIVER FOR VACTRIC

A RECEIVER and manager has been appointed for Vactric Ltd.—less than three weeks after the company revealed a net loss of over £122.000 and serious financial difficulties. Under a power contained in a mortgage debenture the firm's bankers have appointed Mr J. W. Margetts, of Peat, Marwick, Mitchell and Co. as receiver and manager. The latter understands that two subsidiaries, Vactric (Control Equipment) Ltd. and Vactric (Precision Tools) Ltd., which are not directly concerned with the home-appliance trade, are operating on a profitable basis and it is anticipated that they will continue to trade normally.

Vactric Ltd., as manufacturers of vacuum cleaners and washing machines, is probably the largest firm operating a direct-sales organisation for such goods. This side of the business was responsible for the loss sustained in the year ended 31 March last—before the imposition of h.p. restrictions. Since that time the situation has worsened, with substantial stocks accumulating and the group's financial resources strained to the limit, we revealed on 22 Sept.

Capital of Vactric consists of £300,000 in Cumulative Preference shares, £300,000 in Ordinary, and £200,000 in non-voting shares. It is understood that Mr W. C. Pegley, chairman and managing director, holds over 50% of the Ordinary voting shares. A year ago he rejected a takeover bid of 55s a share from Arusha Industries Ltd.

B.E.P.C. 1962

THE 1962 British Electrical Power Convention will be held at Brighton in the week commencing Monday, 4 June, it was decided at last week's meeting.

New Retailers' Organisation to Quiz Manufacturers

FIRST action by a new organisation of electrical retailers will be to ask manufacturers for clear-cut statements on their individual price maintenance policies. The group, known as the Electrical Retailers' Organisation, is in favour of price maintenance and takes the view that the effectiveness of fixed prices is destroyed by offering gifts with each sale.

Initiated four months ago at the request of a number of retailers throughout the country, the organisation intends to build up membership as quickly as possible to a point where registration as a national association will be allowed.

Active in the promotion of ERO is Mr H. A. Curtis, secretary of the organisation and a member of its council, who was associated with the formation of the Radio and Television Retailers' Association some years ago. Other members of the council are Messrs C. R. Spouge, of Lincoln (chairman); R. C. Gilbert, High Wycombe; G. Michelson, Sunderland; D. Sonley, Sunderland; W. R. Stone, Hoddesdon; and S. Fishlock, Rugby. The number of retailers in ERO is not revealed.

"Which?" questions Electric Blanket Safety

DETAILED research into the causes of accidents with electric blankets is called for in the October issue of *Which?*—magazine of Consumers Association Ltd. Tests by the Association on 11 popular single-bed models of well-known brands showed that only seven models complied with the BS, although some of those that failed tests were kite-marked.

If recent recommendations of the New Zealand authorities for safety in electric blankets had been used as criteria, or the existing USA regulations, none of the blankets tested would have been passed as safe.

"Which?" criticises that "The whole situation is unsatisfactory because we have too little information. Too little seems to be known about the precise causes of fires from electric blankets in this country."

One general remark in the survey is that the safety of an electric blanket depends much on the way in which it is used. Clear instructions, it is suggested, should be given by the manufacturer, and followed exactly by the user. Such instructions should include warnings not to switch on if the blanket is wet, not to use the blanket folded and to examine it frequently for signs of wear. (Some of these points are covered by BS requirements for instructions with blankets.)

Which? estimates that there are over 200 models of electric blankets to choose from made by over 40 manufacturers. For this reason it does not suggest a best buy or the like on the basis of its tests. It reports testing two makes of blankets which failed certain electrical safety tests; but these models have been withdrawn so they are not reported on in full.

Which? publishes an electrical glossary as part of its blankets report, defining the common units and saying briefly what a thermostat is. It is noticeable that the glossary seems to ignore the existence of the 13 amp fused plug, saying that for a 4 amp load a 5 amp plug would be used.

Commenting on the *Which?* survey, BEAMA says that the UK is one of the "very few" in the world which has a standard relating to electric blankets. They note that the Molony Committee said the existing BS represented as much protection in design as a technically difficult situation permitted. The standard is under review at present, but in its existing form it is stringent.

OFFICIAL PUBLICATIONS

Advisory Council on Scientific Affairs, Report of. HMSO. 1s 9d (see page 574).

NCB Specification 195: 30 A medium voltage flameproof air-break electrically operated gate-end box. 2s.

Factories (Cleanliness of Walls and Ceilings) Order, 1960. SI 1794. HMSO. 3d (see page 575).

Problems of Progress in Industry, No. 9. Automation and Skill. DSIR Report. HMSO. 3s 6d.

BS 495. Lamp Caps and Lampholders for double-capped tubular lamps. 3s.

Pressed Steel expansion

A MAJOR production plant for Pressed Steel Co. Ltd., at Stratton St. Margaret, near Swindon, is to be built by Holland & Hannen and Cubitts (Great Britain) Ltd. under a £3¼ million contract signed last week. To be completed in 12 months, the plant marks the third stage of development on the site. The Pressed Steel Co. also announced last Friday that the capital of Auster Aircraft had been acquired and the firm is to make a new range of executive and light aircraft for home and export.

G.E.C. cuts t.v. production

LATEST firm to cut television set production is the General Electric Co. Over 200 employees at Coventry have been taken off the production lines and as many as possible transferred to other work, but the GEC fears that a considerable proportion of redundancy is inevitable. The step has been taken after full consultation with the trade unions concerned. GEC state that this cut in production is necessary because of the effect of the credit squeeze on TV sales.

House with heat pump

A SURPRISING claim is made for a new "package" house equipped with a heat pump, being erected at Canterbury. The heat pump cools a larder and supplies space heating and hot water for, it is said, 14s a week. Warm air pumped from the larder and a supplementary 3 kW element provide the heat. Designers of the house are Jonmil Building Developments Ltd. Price of a 1,200 sq ft house, without land—£3,350.

Enters industrial refrigeration here

JOHN THOMPSON (Wolverhampton) Ltd., already established in industrial refrigeration in South Africa, is entering this field in the UK. Directors have decided to form a refrigeration division based on the main group of factories at Wolverhampton.

Specialised refrigeration equipment of all kinds, other than domestic and retail trade equipment, will be designed and manufactured by the new division. Large scale industrial air-conditioning is included in the division's scope. Refrigeration projects for the chemical, oil, food storage and transport and ice-making industries will also be undertaken.

Canada puts 15% duty on steam generating sets

CANADA has now imposed an import duty on steam turbo-generators. Such imports from Britain and the Commonwealth will carry a 15% duty—for certain equipment in the sets a 10% duty will apply. Formerly they were imported duty-free. The new tariff rate applying to certain other countries, including the USA, is raised to 22½%. The latter figure applies to such imports from Switzerland—Britain's chief competitor there—so that the change, in effect, reduces the margin of preference between the two countries from 20% (the old tariff rate) to 7½%.

These changes result from a new ruling by the Revenue Department which maintains that they are "of a class or kind made in Canada." But the change does not affect Canadian orders for such plant placed before 27 Sept. last. Until recently there were no large manufacturers of steam turbo-generators in Canada, but in the past few years such firms as English Electric, Canadian General Electric and Canadian Westinghouse have established plants there to undertake manufacturing work and the size of sets is increasing.

his luminous ceiling lighting installation in the boardroom of the Midland Employers' Mutual Association, Birmingham, is the first in this country to utilise the new p.v.c. louvred tile, "Circlgrid," now being made and marketed here by Harris & Sheldon Electrical Ltd. Two panels each carry 42 "Circlgrid" tiles. Twenty-four 4 ft, 40 W white lamps in batten fittings give an average illumination of 35 lumens/sq ft on the table

Hydro-electric scheme for Glen Nevis

A £4·2 million scheme for utilising the water power resources of Glen Nevis, to provide an annual output of 82 million units, is proposed by the North of Scotland Hydro-Electric Board in its construction scheme, No. 37, published last Friday. Apart from extending the present public road, there would be no works in the main and best known part of Glen Nevis under the plan, which represents the result of careful investigation and of discussion with individuals and bodies interested. The present access to the Ben Nevis peak would not be affected in any way.

In the upper and remoter part of the Glen an arch type dam, 240 ft high, would be built across the head of a gorge, some 2¼ miles above Polldubh, to form a new loch 1½ miles long. From this loch water would be led by tunnel to an underground power station, capacity about 25 MW, close to the shore of Loch Leven and which would discharge into the loch some two miles west of Kinlochleven. The plant would operate under a maximum head of 940 ft—one of the highest in the country.

Water would also be collected for use in the scheme by piped aqueducts and tunnels from some streams on the south and north sides of Glen Nevis, on the north side of Loch Leven and from the upper tributaries of the River Kiachnish which flows to Loch Linnhe. After passing through a small generating set, compensation water would be released at the end of the gorge below the dam.

Electricity generated at the underground power station on Loch Levenside would be fed into the Highland grid by a short transmission line to an existing substation behind Fort William. Emphasising that Ben Nevis would not be affected by the scheme, the Board state that the flow down the waterfall at Polldubh would be greater than the natural flow there during the summer, but the height of the Falls of Steall, in upper Nevis valley, would be halved when the reservoir is full.

Although the National Trust for Scotland has stated that they do not feel the published version of this project gives sufficient information for a balanced judgment of its merits, Mr Gerald Nabarro, M.P., has already given notice that he will object to it. He considers the cost of the scheme—£168/kW—"is unusually expensive and extravagant."

Reappraisal suggested for N. Scotland

A COMPLETE inquiry and reappraisal of the functions of the North of Scotland Hydro-Electric Board in the light of the radical changes in the national fuel situation, brought about by the surplus of coal and oil, is being sought by the executive committee of the Scottish Landowners' Federation. At their meeting last week the committee decided to recommend that until there had been such a review, all schemes still under survey should be suspended—including, the Glen Nevis scheme (see this page).

The committee said they recognised the achievements of the Hydro-Electric Board in circumstances not originally envisaged and they believed the Board had completed its task. They suggest that as an alternative the further power supplies for the South of Scotland area should be generated in that region itself, with the Hydro Board concentrating on completing the connection of outlying districts to its system. If necessary, supplies be imported from the south, or small plants established.

1200 MW station planned in S. Scotland

A NEW 1,200 MW steam power station "somewhere in the Lothians" is being planned by the South of Scotland Electricity Board. Further news on the plans—already referred to in these pages—was given last week by Mr William Hutton, deputy chairman of the Board. Nineteen possible sites are now under consideration, but it was intended that the station should draw its coal from the developing Lothians coalfields and would be situated as near the pits as possible. Ultimate capacity of the station would depend upon the amount of coal which the National Coal Board could make available.

The S. Scotland Board are also negotiating with the NCB for the acquisition of the latter's generating stations. As part of the replacement policy which would follow this takeover, the S. Scotland Board are now exploring the possibility of a slurry-burning station in Fife, as part of the post-1966 programme. "We are encouraged in it by the striking success of the Barony slurry-burning station in Ayrshire. The Fife project will use about 250,000 tons of slurry a year—almost all the output of slurry from the area—and have a capacity of 60 MW," Mr Hutton stated.

G.E.C.—Simon-Carves

A PRIVATE company with the title GEC—Simon-Carves Atomic Energy Co. Ltd. has just been formed to take over and give formal standing to the GEC—Simon-Carves Atomic Energy Group which has been a loosely knit organisation. The new company has an initial capital of £50,000 in 30,000 "A" Ordinary and 20,000 "B" Ordinary £1 shares.

Floods—but no breakdowns

ALTHOUGH some parts of southern England had their worst floods last weekend since the 1953 east coast havoc, the electricity boards supplying the areas have come out of the troubles relatively unscathed. In Lincolnshire, one of the worst affected areas, for instance, there were no interruptions on the h.v. system of the East Midlands Electricity Board and the staff of the Lincolnshire subarea have been able to cope without seeking outside help. At Horncastle it was necessary to change cut-outs and meter linkage in about 150 premises.

In Devon, the South Western Electricity Board also maintained supplies and in Exmouth between 700 and 800 premises were dealt with over the weekend, with the aid of additional workmen drafted in from outside the district. Again, it was a question of putting the installations in order after water had been pumped out, a situation which applied in many other trouble spots.

LARGE CONTRACTS

JOHNSON AND PHILLIPS are to supply two 13-panel and two 11-panel 250 MVA, 6·6 kV compound-filled metalclad switchboards for Richborough power stations. They are for control of the auxiliaries and will be equipped with the new J and P type PDB oil arc-control circuit-breakers. All feeder c.b's will be provided with d.c. solenoid mechanisms arranged for remote control.

BOWATERS Engineering and Development Inc., of Calhoun, Tennessee, has ordered from AEI (Canada) Ltd. seven single-reduction gearboxes and spares worth £70,000, for use in a wood-pulp mill in New Zealand. The gearboxes, each of which will transmit 6,325 h.p., will be manufactured at Rugby by AEI Heavy Plant Division. Six boxes will have a speed reduction of 1,000/250 r.p.m. and the seventh, 1,000/300 r.p.m. The reductions of the replacement rotating parts will be from 1,000 to 375, 333 and 250 r.p.m., respectively. The equipment has been ordered on behalf of the Tasman Pulp and Paper Co. Ltd., Kawerau, NZ.

A CONTRACT worth £153,000 for the construction of two reinforced concrete brick-lined chimneys at Blyth "B" power station has been awarded to Mitchell Construction Co. Ltd. The chimneys will each be 550 ft high, one of 27 ft internal dia and the other 30 ft at the top.

RURAL ELECTRIFICATION AIMS

Eastern Board seeks completion in 5 years

COMPLETE electrification of the rural areas of the Eastern Electricity Board is the aim of "Operation Round-up," a five-year scheme launched last week by Board chairman Mr. H. V. Pugh. The remaining 15% of farms, together with other rural premises, he hopes to get connected within the next five years at no higher capital cost to the new consumers than their predecessors have paid.

Because the premises remaining to be connected are very scattered and remote, Mr Pugh estimates that the cost of bringing electricity to them will be two or three times as much as for consumers connected during the five years past. In that period the number of farms connected by the Eastern EB has risen from 18,330 (March, 1955) to 26,110 (March, 1960). At the end of August it was estimated by the Board that about 5,000 farms remained to be connected. Mr Pugh thinks that all buildings except those with only a short life remaining and isolated week-end cottages will be provided with a supply.

Despite the increasing remoteness of the premises to be connected, the standard connection charges introduced by the EEB in 1958 will be applied. Consumers in small domestic premises will pay about £1 1s/quarter for seven years as a capital contribution and those charges extend up to £13 15s/quarter for the same period for connection of a 500-acre farm. These charges were fixed on the basis of the rural connection programme for the three years 1958 to 1961, which took the EEB from 74·2% of farms to 85%. Estimated costs were pooled and standard connection charges fixed to give the overall return required.

Extension of these standard charges to the more remote consumers is a move by the Board to encourage fullest possible support for connection schemes. There will be a drive for 100% acceptance of schemes by potential consumers. If there is a refusal to take a supply by one member of a group, the scheme for the whole group may be scrapped.

The Board's managers have instructions to "plan and construct the lines in a way which will keep the ultimate capital cost to the minimum and at the same time ensure that in each year the maximum number of consumers is connected out of available capital."

An important element in deciding success or failure of the scheme will be readiness of landowners and farmers to grant wayleaves for lines over their land. "The community as a whole is trying to do its best for the outlying country folk," said Mr Pugh. "They are entitled to look for the support which will enable the work to go forward at least cost."

Appeal on "know-how" tax case

THE High Court ruling allowing appeals by Rolls-Royce Ltd. against tax assessments arising from the sale of technical knowledge (reported in our 2 June issue) is to be challenged by the Inland Revenue. Rolls-Royce have maintained that they carried out considerable research and development work on aircraft engines and, subsequently, made a series of agreements with many countries under which the firm received lump sum payments for providing the countries with the necessary drawings and information to make their own engines. The action concerned assessments in the firm's profits amounting to over £15 million for the years 1948-55. The company contended that their store of technical "know-how" was a fixed capital asset which was disposed of to the countries. Mr Justice Pennycuick upheld that appeal, but the Inland Revenue are to ask the Court of Appeal to reverse that decision.

Purchasing in Europe

THAT is the title of a 108-page publication just issued by the European Federation of Purchasing which contains all the papers given at the Federation's second conference in Holland last April. The papers are given in three languages, English, French and German, being in full in their original language, with summaries in the other two. Copies are available from the Federation, 146a Queen Victoria St, E.C.4, price 5s.

Socialist Veiws on Nationalised Industries

CONNECTIONS between nationalised industries and the "private sector" of industry are discussed in a new publication of the Fabian Society, *Nationalised Industries in a Mixed Economy*, by Mr J. Hughes. The author considers a wide range of topics, including Government intervention in price policy and what he considers the theoretically mistaken (though possibly politically acceptable) practice of pricing to break even on revenue account, rather than achieve a substantial surplus. The author is strongly critical of nationalised industry generating capital gains for private shareholders, as he puts it. He quotes orders from the CEGB to the electrical plant manufacturing industry as an example of this. The pamphlet is published by the Fabian Society, price 4s.

New Redditch H.Q.

NEW headquarters and depot for the Redditch and Bromsgrove district of the Midlands Electricity Board were inaugurated last week. The new premises, in Windsor Rd, Redditch, include a two-storey office block, stores and workshop block, and garage, all with electric floor-warming, with a total heating load of 500 kW. A 66/11 kV substation is under construction. At Feckenham, nearby, the CEGB are establishing a new grid point on the supergrid, and the MEB are building a £300,000 substation. In the Redditch and Bromsgrove district the percentage of farms connected is now 96·5%—a high figure.

GOVERNMENT SCIENTIFIC POLICY

WHETHER the scientific research effort in the UK is spread over the various branches of science in the most rewarding way is discussed at length in the annual report of the Government's Advisory Council on Scientific Policy. No simple answer is put forward, but the Council warn that it is becoming increasingly clear that the "growing points" of science are found most frequently in areas lying between the traditional subjects. In universities, this situation needs to be met by a greater willingness of established departments to accept studies which lie partly outside their traditional field.

Looking at research and development effort overall, the Council estimates that Government provides 66·9% of the finance, but that most of this (49% of all expenditure) comes from the defence departments. Private industry contributes most of the balance, no less than 28·5% of the whole. On a basis of proportion of gross national product spent, the UK is now almost up with the USA. America spent £3,971 million on research and development in 1958, 2·74% of the gross national product; while the UK spending, at £478 million, represented 2·35% of gross national product. It is reckoned that the proportion of spending attributable to defence was somewhat greater on the part of the USA.

The report records that during 1959, universities awarded 357 honours degrees in electrical engineering, 13 more than in the previous year. These figures do not include diplomas and pass degrees.

Mr D. H. Kendon (second left), MANWEB chairman, discusses a relevant point with Mr D. G. Dodds (left) in front of a Simplex lighting fittings exhibit at the display of industrial products staged by TI Electrical Division in co-operation with MANWEB at their Industries Centre, Liverpool

Restricted Home Market Unprofitable

—says Mr. Stanley of Pye

TRANSFER of export production from Cambridge to Italy if existing restrictions in the UK continue, that is the proposal being considered—it is almost a threat—by Mr C. O. Stanley, chairman of Pye Ltd. Main trouble is the television industry where present stocks amount to over one million sets and manufacturers are cutting output severely. Mr Stanley has just returned from Italy where Pye have bought a factory at Inverigo, near Milan, initially to gain a foothold in the Common Market. But the directors are now looking at this venture as a wider opportunity to sell in other countries using the 625-line system.

"If the Chancellor of the Exchequer really wants to make our UK market disappear, it might be much better not only to make TV sets in Italy for local sale in an expanding market, but with that basis to serve export buyers from Italy instead of from Cambridge," Mr Stanley has stated. He considered the present UK home market now so much restricted as to be unprofitable. "We will have to cut overheads and distribution costs, do a small business here of Cambridge-made sets, close the Northern Ireland factory and halve production at one of our other factories," he said. Although less than half the group's profits came from TV and radio, in his view it would be far better to trade from Eire or Italy rather than face losses here.

"We intend to make in Italy all the things we sell in Britain under the Pye trade-mark, including specialist instruments, communications equipment, specialist radio and telephone gear and some domestic electrical appliances, but not refrigerators," he added.

Earlier this week the Radio and Television Industry sent a telegram to the Prime Minister urging government action to alleviate the effects on the industry of the present credit squeeze.

B.S.I. needs funds

THE Government having pegged its grant to the British Standards Institution for the next three years at a level only slightly above last year's rate, BSI needs greater financial support from industry if it is to carry out its job effectively. This view was emphasised by BSI leaders at the annual meeting recently. An approach to all subscribing members to change some conditions of membership as a step to increasing revenue had met with satisfactory initial response, the meeting was told.

Evidence of BSI's effectiveness is shown in a rise in sales of publications of British Standards from 890,000 copies in 1958-59 to a record 1,097,000 in the past year. Sales of overseas standards have almost doubled in four years.

Pointing out the UK's support for international standards, Sir Herbert Manzoni, a deputy president of BSI, told the meeting that there were British Standards corresponding to over three-quarters of the recommendations approved by the International Standards Organisation.

Sir Herbert recalled that agreement had been reached at Zürich a few months ago on steps for the co-ordination of the standards of countries in the "Six" and the "Seven."

Electrical output high

ELECTRICAL engineering production was 10% higher in the first half of this year than in the corresponding period of 1959, but the advance slackened pace in the second quarter. The index compiled by the Board of Trade fell from 149 in the first quarter to a provisional 142 for the three months to June.

New orders received by the engineering and electrical goods industries declined by 13 p.c. in the second quarter from the particularly high level of the first three months, but recovered quite sharply in July.

OPINIONS ON CLEAN AIR

HOW the Clean Air Act is working, and what research is going on to help forward the drive to keep down atmospheric pollution, were important topics at last week's annual conference of the National Society for Clean Air, held at Harrogate under the chairmanship of Sir Hugh Beaver. In a report on a special investigation carried out by the Society it was stated that up to March, 1960, only 125 smoke control areas had been created, by 67 local authorities. However, there were signs that such activity was gaining in momentum. Smoke control areas are in the main involving groups of about 500 premises, although up to 5,000 have been included.

Disappointment with the rate of progress under the Act was voiced by Sir Hugh Beaver in his presidential address, but he praised industry for the effort it was making to reduce air pollution. He mentioned specially new power stations, "all virtually smokeless, with very high performance grit arresting plants and chimneys up to 600 ft high."

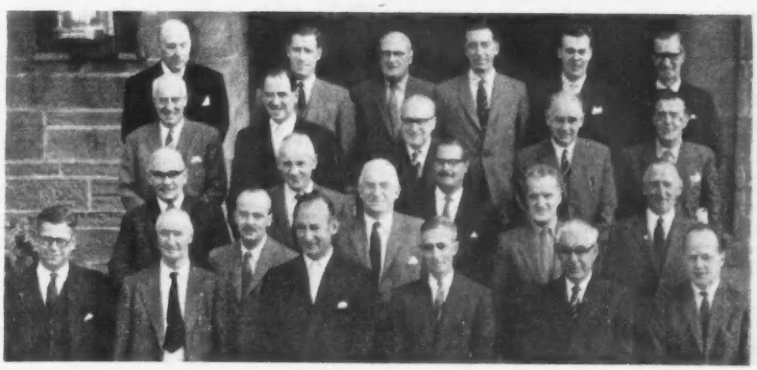
As usual, an exhibition was held in connection with the conference. AEI showed their electrostatic method of measuring dust in furnace effluent. Berry's showed fires qualifying for grant under the Clean Air Act, while GEC also had electrical heating equipment on display, including block-storage heaters. L. G. Hawkins were another firm with exhibits in this field, while Thermoduct Ltd. showed withdrawable floor-warming equipment. The electrostatic precipitator firms were well represented, including W. C. Holmes, Lodge-Cottrell, Simon-Carves and Sturtevant. The CEGB and EDA were amongst other stand holders.

Factory walls must be washable

FACTORY wall interiors must now be repainted as often as necessary to maintain a continuous film capable of being washed to the satisfaction of the factory inspector, under amendments to the Factories Act. The minimum interval of seven years between repainting has been retained, but the whole or part of a factory may be exempted. Greater flexibility in the choice of materials is introduced by allowing the use of "suitable" paint, instead of specifically "oil" paint. This brings the regulations into line with developments in the paint industry, such as plastics paints.

E.W.F. MEET IN SCOTLAND

Our photograph below was taken at the recent meeting of members of the Scottish Section of the Electrical Wholesalers' Federation and the Council of the EWF, held at Troon. It shows, back row (left to right): A. Baillie, J. A. Cartwright, J. Aikman, G. McIver, D. Boyle and A. Heggie; fourth row: L. B. Burn, T. S. Weston, H. D. Denman, G. W. Hamilton and A. McNeilage; third row: J. W. E. Rutherford, W. McIntosh, F. J. Blackwell, R. Melvin and E. H. Stein; second row: J. H. Hirst and C. H. Blackburn; front row: P. B. Etheridge (director), J. M. Milne, G. Conradi (president), J. Kerr (chairman, Scottish Section), H. Riley and J. Aikman, Jnr. (secretary, Scottish Section)



E.D.A. aids floor-warming

TWO new publications on floor-warming have been issued by EDA. One is an 18-page booklet, mainly for the use of architects, *Notes on the Construction and Finish of Floors that are to be Electrically Warmed*; and the other an eight-page illustrated folder for salesmen, *Electrical Floor Warming, Questions and Answers.*

Two main methods of floor construction are considered in the booklet, monolithic and layered. In the first method the heating cables may be laid on the sub-floor while it is still plastic (if concrete) and covered with a screed; or within the concrete floor slab while it is being laid. Layered construction is the method employed for construction of suspended floors and where floors in contact with the ground have already hardened before heating cables and screed are laid. The booklet also discusses floor finishes and contains brief notes on electrical testing and system control.

Copies of the booklet (EDA 1927) and of the folder (EDA 1934) can be obtained from electricity service centres or direct from EDA, 2 Savoy Hill, W.C.2.

Faster computer system

A NEW medium-to-large general purpose digital computer system—the KDF9—is being introduced by English Electric Co. Among its features is a very high speed of operation (with a main core store of six microsec cycle time and multiplication in 14 microsec or less). Costing from £125,000 upwards, the first production model is scheduled for operation in 1962 and the company claim it will be many times faster in operation than any machine now in use in this country, without a comparable increase in costs.

Sayings OF THE WEEK

"If electricity supply is to play a part in counter-cyclical operations, some fat must be put on the systems first. At present the bones of the distribution networks are almost showing through the skin." . . . MR R. S. EDWARDS, Electricity Council deputy chairman, writing on the ability of the supply industry to cope with ups and downs in the national economy.

"Any further talk of legislation to control office conditions or fire risks in offices or public buildings is simply wishful thinking unless such legislation is backed by workable powers of enforcement—and, most important, by a determination to enforce it." . . . J. CRABTREE, writing to *The Guardian.*

"Basic advances in science depend upon the creative individual. This process cannot be controlled; the theories that such progress can be produced merely by pouring in money and resources are without foundation." . . . Annual report of the Advisory Council on Scientific Policy.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, October 11

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	226½	−½
,, (3 months)	228	−½
LEAD, refined pig, 99·97% purity (cash)	66½	−2½
,, (3 months)	68¼	−1½
TIN, refined, min. 99·75% purity (settlement)	811	+9
,, (3 months)	801½	+3
ALUMINIUM, ingots 99·99·5% ...	186	—
,, wire bars (4 × 4 × 54")	193½	—
BRASS Strip 63/37	200½	—
SILVER (Troy oz)	79½d	+¼d

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	88½	+1½
,, (3 months)	89¼	+¾
RUBBER, per lb		
No. 1, RSS, spot	28½d	−⅛d
c.i.f. basis, ports, Dec. ...	28½d	−⅛d
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	66½	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	70	—
AMERICAN PRICES:		
Copper, electrolytic (per lb) ...	31c	—
Lead, (New York)	12c	—

* *Tape Price, now an average, includes varnishing*

Soviet Engineering's High Proportion of Women

THAT as many as 35% of qualified Russian engineers are women was revealed by a delegation recently returned from a visit to the USSR, organised by the Caroline Haslett Memorial Trust. Members of the delegation were Miss L. Souter and Miss R. Winslade, both practising electrical engineers, who discussed their experiences at a conference organised by the Electrical Association for Women. Employment of women on equal terms with men in all professions is the accepted norm in the Soviet Union today. Cases were quoted of women acting as supervising engineers over men in factories and even on heavy construction sites. Particular branches of professional engineering chosen appear to be evenly divided among Russian women engineers with a slight preference for engineering economics. Marriage is regarded as being complementary to a professional career.

These facts contrast sharply with the position of women engineers in the United Kingdom, shown by a recent Ministry of Labour survey, where the proportion of women in engineering is only about 0·1%. The opinion widespread among British employers is that professional engineering is not, on the whole, a suitable occupation for women.

L.C.C. to try oil hot-air heating

EXPERIMENTS with hot-air space heating for isolated tall blocks of flats, using a roof-mounted oil-fired boiler, are planned by the LCC Housing Committee. Location of the oil-fired boiler on the roof avoids the need to provide a flue the full height of the block. Warm air units will have outlets into the hall, kitchen and living room of the individual flats.

The system is designed to give continuous background heating throughout the flat to about 10°F above the outside temperature and the tenant will be able to increase output of the heating unit to 5 kW.

Installed in a 17-storey block of flats in place of electric floor-warming, the hot-air heating installation is calculated to involve an additional capital cost of £6,565, or about £98/dwelling.

Electricity will be left with the water heating load when this hot-air method of heating is installed.

Electrify and Revive

"ELECTRIC rail services are economical and reliable and, as we have found from the Kent Coast scheme, there is enormous traffic potential," Sir Philip Walker, chairman, BTC Southern area board, stated on Monday. "At Folkestone, which was a dead town five years ago, every inch of building land is now bought at a high price," he went on. British Railways plan to electrify train services from London to Bournemouth, Weymouth and Salisbury in the next four years.

News in Brief

Demand for tickets for the EIBA ball at Grosvenor Hse on 11 Nov. is exceeding the number of guests that can be accommodated, we are told.

Taylor Electrical Industries—a member of the Metal Industries Group—sold all the equipment they exhibited at the recent Bruno Fair, Czechoslovakia, and took orders worth a further £1,000.

A 22-year-old trolley-bus presented by London Transport to the Association pour le Musée des Transports Urbains, Interurbains et Ruraux for its Paris museum was taken across the Channel last week-end. It has a Leyland chassis.

Evershed and Vignoles Ltd. recently held their first apprentice "open day" which parents, education officers, youth employment officers and teachers attended.

Mr L. Rotherham, Member for Research, CEGB, will lecture on "The Contribution of Metallurgy to Electric Power Generation" in London on 29 Nov. as the Hatfield Memorial Lecture for the Iron and Steel Institute.

The net surplus of the Belfast electricity undertaking for the year ended 31 March last is £198,432—not £791,094 as we incorrectly stated on 25 Aug.

Company Activities

THE new fortnightly Stock Exchange account which opened last week proved to be a bouncing baby. After a quiet start things really began to hum and though business was as usual modest prices stayed on the upgrade. Some City folk were frankly puzzled by this show of strength. Shortage of stock explains why prices should be sensitive to demand, but hardly why buyers should have suddenly taken fresh courage. News from Wall Street is no better and the latest hire-purchase figures show that the credit squeeze is working. So where, it is asked, do investors derive their inspiration? The answer seems to lie in the continuing good health of the "heavy" end of industry. Booming orders for machine tools and the apparent determination of motor-car manufacturers to go ahead with their vast expansion programmes draw attention to the built-in buoyancy in the economy that exists even now. If and when the Government feels able to relax its credit restrictions, industry should fairly roar ahead, hence the recent interest in good class equities. The further increase in Britain's gold and convertible currency reserves last month has been favourably interpreted in this respect, but it would be rash to base hopes of an early reduction in Bank rate purely on this one indicator.

Interest in the gilt-edged sector has centred on the efforts of the Government to re-establish control over the "long" end of the market by a new issue of £500 million 5½% Treasury stock 2008-2012. Government departments took up most of the stock which started life in the market at 95 1/16 a premium of 1/16 over the offer price. Another recent feature in gilts has been some energetic switching into conversion 5% 1971, which is the Government's medium dated "tap" stock.

In this generally cheerful atmosphere electrical shares managed to move ahead despite reports that the rate of expansion in the engineering and electrical industries is slowing down. Gains tended to be modest and seldom exceeded 1s with the exception, that is, of Crabtree Electrical which jumped 5s in two days. The company's results are expected out later this month and it looks as if the "bulls" are moving in for a short-term profit on hopes that the final dividend forecast of "not less than" 7½% will be exceeded. Scarcity of stock might account for the speed of the rise in the price though of course for a company of medium size like Crabtree a take-over situation cannot be completely ruled out.

Another name that stood out was Vactric where a veritable see-saw took the shares down to 9s 7½d prior to the announcement last week-end that the bankers have appointed a receiver and manager (see page 571).

A bigger row is blowing up over Ada (Halifax), the washing machine and machine tool manufacturers, which last year also started making domestic refrigerators. The Philips Electrical giant has stated that its offer for Ada has been effectively accepted in respect of approximately 70% of the Ordinary shares it does not already hold. But at the eleventh hour the shareholders' committee, which was formed to oppose the bid, is considering applying to the Board of Trade for an investigation into the company's affairs.

The other takeover in the electrical industry is proceeding more smoothly. EMI has announced the receipt of acceptances in respect of over 98½% of the Morphy-Richards Ordinary stock. In due course action will be taken to acquire the outstanding balance.

The shares of Relay Exchanges jumped 1s 6d on the favourable half-time report. The directors have stated that business continues to expand and pass the benefit on to shareholders with an interim dividend maintained at 8% on a capital increased to £4,526,069 by rights and scrip issues. The 1959 interim is equivalent to 5½% on the present equity.—*From our City Correspondent.*

Ada (Halifax) Ltd.

A number of shareholders who are dissatisfied with Philips' takeover offer of 3s 9d per 1s share are endeavouring to get an improved offer. Alternatively, they want a representative of the minority shareholders elected to the Ada board.

Bakelite Ltd.

There is to be a one-for-five scrip issue and the directors propose to recommend an interim of 6% (the same as for 1959) on the increased capital.

British Aluminium Co. Ltd.

Consolidated trading profit for the year ended 31 July last amounts to £5,133,651, and there is a final dividend of 8% making a total of 12%. For the previous seven months, trading profit was £2,004,418 with a single payment of 5%.

Copeland and Jenkins (Holdings)

It is proposed to increase the capital to £1 million by the formation of 400,000 unclassified £1 shares. The directors say that this increase will enable them to deal with any opportunity which may occur, although they are not aware of any at the moment.

Electrical Apparatus Co.

After charging taxation at £127,000 (*£113,403*), the net profit for the year to 31 July last, subject to audit, is £143,000 (*£144,461*). Final dividend is raised 4% to 14%, making the total 20% (*14½%*).

Kenwood Manufacturing Co.

There was little encouraging news for shareholders at last Thursday's adjourned annual meeting and Mr J. H. Senior, the chairman, explained that with the physical stocktakings and consolidation of the figures for the first joint year including overseas subsidiaries, it was impossible to produce accounts yet or even to quote figures, as these had not been completed. The full accounts should be available in December, by which time he hoped that results from August onwards would have helped considerably to restore the effects of the setback. Sales of the new "Kenwood Chef" in August and September were 50% above the highest level ever reached by its predecessor and demand is still well in excess of supply, he added.

Richard Johnson, Clapham and Morris

A final dividend of 15% makes a total of 20% for the year ended 30 June last on old capital (*same*), and 3¾% is to be paid on the new rights shares, as forecast. Trading profit is £64,017 (*£57,229*) before taxation.

Perak River Hydro-Electric Power Co.

There is better news on operations for the year ended 31 July last. In addition to a final dividend of 6%, making the total 10%, there is a special dividend of 5% which is recommended in view of the lower return on shareholders' investments during the period of tin restriction. In the previous year only 5% was paid. Net profit for the year just ended rose to £532,686 (*£146,161*) after charging depreciation at £320,000 (*£300,000*), but before tax of £237,535 (*£76,000*).

Pifco Holdings

Turnover for the first four months of the current financial year has been maintained and the order book is satisfactory, Mr A. D. Webber, the chairman, reports. He considers the reimposition of hire-purchase restrictions could even be beneficial to the company, for the earlier removal did not bring any benefit, retailers preferring to promote the sale of major household appliances. The amount due to the vendors of shares in the subsidiary company, Pifco Ltd., has been reduced by £20,452—and at the end of April amounted to £489,548. It is the intention of the board to pay off a substantial part of the balance during the present year and it is hoped to discharge the remainder as soon as possible.

Intended Dividends

Barton and Sons. Interim 7½% (*5%*). The increase being to reduce disparity between interim and final payments.

Relay Exchanges. Interim 8% on increased capital (*against equivalent of 5½%*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

13 Oct.—Stornoway Pier and Harbour Commission. Electrical work in erection of Customs Hse/Government offices/two dwellings in South Beach/Quay St.—See 6 Oct issue.

14 Oct.—Hitchin U.D.C. Erection and commissioning of 30 Class "A" and 65 Class "B" lighting units in various areas.—See 6 Oct. issue.

14 Oct.—Maidstone B.C. Scheme PW9, electrical installations in 24 flats in four blocks on Parkwood Housing estate.—See 6 Oct. issue.

14 Oct.—North Riding C.C. Installation of passenger lift and alterations to 19 Royal Cres, Whitby. Applications to County Architect, County Hall, Northallerton, by above date.

14 Oct.—Ross and Cromarty C.C. (g) Electrical work in erection of two blocks of two four-apartment houses at Tore, Black Isle.—See 6 Oct. issue.

17 Oct.—Chelmsford R.D.C. Provision and erection of 64 Group "A" 25 ft concrete columns/brackets and 140 W side entry sodium lanterns/lamps/gear along A12 at Mountnessing.—See 6 Oct. issue.

17 Oct.—Eccles B.C. Electrical installation including underfloor heating in proposed Peel Green Branch Library. Engineer and Surveyor, Town Hall Annexe, Irwell Pl.

17 Oct.—Knaresborough U.D.C. Supply and erection of 50 Group "A" concrete columns with sodium discharge lamps/control gear for Bond End/Boroughbridge Rd street lighting.—See 6 Oct. issue.

17 Oct.—Northants C.C. (b) Electrical installations in Corby Beanfield new infants' school and Roade Modern School extension. Applications to County Architect, County Hall, Northampton, by above date.

17 Oct.—Poole B.C. (Item b5). Electrical installation in erection of 10,755 sq ft six-classroom Hillbourne Primary School. Applications to Borough Architect, by above date.

17 Oct.—Wallasey C.B. Electrical installation in Moreton Secondary Modern School extensions.—Advertised 29 Sept. issue.

18 Oct.—Beverley R.D.C. (e) Electrical installation additions to 39 houses at Newbald, Wawne, Lund, Cherry Burton, Woodmansey, Little Weighton, Skidley and Swanland.—See 29 Sept. issue.

18 Oct.—Littlehampton U.D.C. (Contract 24). Electrical installations in six houses, Helyer's Gn, Wickbourne estate.—See 6 Oct. issue.

18 Oct.—Liverpool C.C. Supply of (a) 1 kW transformers; (b) fluorescent fittings; (c) fluorescent tubes. General Manager, City Markets Dept., Stanley Abattoir, Prescot Rd, Liverpool 13.

18 Oct.—Manchester C.C. Supply of 2,000 time switches during 1961. City Surveyor, Town Hall.

18 Oct.—Newton Abbot R.D.C. (1) Supply of ten Group "B" fluted steel columns/brackets/lanterns/time switches; (2) supply, erection and commissioning of 61 Group "A" columns/lanterns at Kingskerswell. Engineer and Surveyor, Council Offices, Kingsteignton Rd. Deposit £2 2s each contract.

19 Oct.—Durham C.C. Electrical installation renewal at Houghton-le-Spring R.C. (Aided) School and Shotley Bridge E. F. Peile Convalescent Home. Applications to County Architect, G. W. Gelson, South St, Durham, by above date.

19 Oct.—Kirkburton U.D.C. Supply and installation of 88 200 W sodium discharge lamps on 35 ft steel columns for A629 Penistone Rd (second part) lighting.—See 29 Sept. issue.

19 Oct.—Sunderland T.C. Cable laying, 2,000 yd of 2-, 3- and 4-core p.i.l.c.s.t.a. cable for street lighting.—See 29 Sept. issue.

20 Oct.—Louth R.D.C. Contract 29: Supply and erection of 18,750 g.p.h. duplicate horizontal centrifugal booster pumps together with motors, starters and accessories for Kenwick Reservoir.—See 6 Oct. issue.

20 Oct.—Penybont R.D.C. (d) Lighting scheme for Llangynwyd comprising 140 W sodium lamps on 25 ft columns. Engineer and Surveyor, Greenmeadow, Coity Rd, Bridgend. Deposit £3 3s.

21 Oct.—Bristol C.C. Supply of lamps, batteries, transformers, capacitors, sundries, cables, etc., for year.—Advertised 6 Oct. issue.

21 Oct.—Cork. Electrical services installation at Cork Airport.—See 6 Oct. issue.

22 Oct.—Bexhill B.C. Supply, erection and putting into service of 52 140 W sodium lamps on 25 ft reinforced concrete columns.—See 29 Sept. issue.

21 Oct.—New Windsor B.C. Street lighting installation scheme, 1961: (a) 26 400 W colour-corrected mercury lamps on wall brackets for Thames St/High St area; (b) 17 80-125 W mercury on brackets; (c) six 80-125 W mercury in special lanterns; (d) removal of existing Group "A" steel columns. Borough Engineer, Kipling Bldg, Alma Rd.

22 Oct.—Lichfield C.C. Supply, erection and installation of 15 Group "A" steel columns, sodium lanterns and ancillary equipment for Sandford St lighting. City Engineer and Surveyor, D. Oglesby, Meredith Hse, 62 Wade St. Deposit £2 2s.—Advertised in this issue.

22 Oct.—Seaton Valley U.D.C. Supply and erection of 329 units and supply only of 132 units for street lighting scheme.—See 6 Oct. issue.

24 Oct.—Adlington U.D.C. Supply, erection and wiring of 16 60 W sodium lamps replacing tungsten at Railway Rd, B6227. Surveyor, N. R. Bolton, Council Office, Railway Rd, Adlington, Chorley.

24 Oct.—Beverley R.D.C. Supply and erection of: Contract 2, two 180 g.p.m. sewage pumps and two 100 g.p.m. sludge pumps; Contract 3, four 40 g.p.m. and two 30 g.p.m. sewage ejectors for Leven and Tickton Sewerage Schemes.—See 29 Sept. issue.

24 Oct.—Billingham U.D.C. (Contract L1.) Supply: 15 concrete columns, A19; (L2) supply: 69 steel columns, A19; (L3) supply: 140 W sodium lanterns/lamps/gear; (L4) supply: 400 W m.v. lanterns/lamps/gear; (L5) provision and laying of cables, servicing of columns and lanterns; (L6) erection: 84 columns/lanterns, A19; (L7) provision and laying cables, New Rd; (L8) erection: 33 columns, New Rd; (L9) provision and laying cables, Haverton Hill Rd; (L10) erection: 59 columns/lanterns, Haverton Hill Rd; (L11) supply: 92 concrete columns, New and Haverton Hill Rds.—See 6 Oct. issue.

24 Oct.—E.B. for N. Ireland. Supply and erection of lighting and heating for No. 3 set at Coolkeeragh Power Station.—See 29 Sept. issue.

24 Oct.—Ellesmere Port B.C. Provision and erection of 34 Group "A" concrete columns/lamps complete, contract No. 298, for A41 Chester/Birkenhead Trunk Rd. Borough Engineer and Surveyor, Queen St.

24 Oct.—Kingston upon Thames. Roof renewal, electrical ancillary works, etc., at Corpn. Depot.—See 29 Sept. issue.

24 Oct.—Pelton P.C. Erection of 30 60 W sodium lamps on concrete columns.—See 6 Oct. issue.

24 Oct.—S. Devon Water Board. Supply of 1,800 g.p.h. at a 286 ft head duplicate pumps and ancillary equipment for Sheldon Pumping Station.—See 6 Oct. issue.

25 Oct.—Ealing B.C. (a) Supply of 88 140 W sodium lanterns/lamps/gear; (b) supply and erection of 85 25 ft steel columns.—Advertised 15 Sept. issue.

26 Oct.—Cardiff C.C. Complete £38,000 electrical installation, by contractors on N.I.C.E.I.C. roll, in proposed Teachers' Training College, Cyncode.—See 29 Sept. issue.

26 Oct.—Eire C.I.E. Form 137. Supply of lamps for premises and automobiles. Purchasing Officer, Inchicore, Dublin.

26 Oct.—Manchester C.C. (a) Electrical installation and (b) supply and erection of passenger/goods lift in new hostel block, Didsbury Training College. City Architect, P.O. Box 488, Town Hall.

26 Oct.—Newbury B.C. Supply and erection at London Rd Pumping Station of two v.s. (each 186,000 g.p.h.) and three (each 75,000 g.p.h.) centrifugal pumps for unscreened sewage. Details from consulting engineers: Howard Humphreys and Sons, West St, Epsom. Deposit £5 5s, made payable to B.C.

26 Oct.—Whitchurch U.D.C. Phase 1. Supply, erection and wiring of 45 150 W sodium lamps on 25 ft concrete columns and 59 85 W sodium on 15 ft columns.—Advertised 29 Sept. issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 109 queries answered this week

"Orrefors" glass lighting fittings—agents for? E.H.M.—J. Wuidart and Co. Ltd., 15 Rathbone Pl, W.1.

Self-illuminated flower vases—makers of? E.E.B.—Miller Kent Decoratives Ltd., 106 George St, W.1.

"Desilux" horns—makers of? A.W. and D.—Desilux Electrical Equipments, 143 Whitfield St, W.1.

"Thermotube" tubular heaters—makers of? L.E.B.—E. K. Cole Ltd., Ekco Wks, Southend-on-Sea, Essex.

"Cheeto" food mixers—suppliers of? E.E.—Edmundsons Electrical Wholesalers Ltd., 240-250 Ferndale Rd, S.W.9.

"Kanthal" resistance wire—address for? T.E.—Hall and Pickles Ltd., 64 Port St, Manchester 1.

"Expandet" PVC screw anchorings—makers of? A.W.C.—Expanded Plugs Ltd., 9 College Hill, E.C.4.

"Maytag" washing machines—repairers of? E.E.W.—A.E.I.-Hotpoint Ltd., 11 Avon Trading Estate, Avonmore Rd, W.14.

ANSWERS WANTED

United States Electrical Tool Co., Cincinnati—agents for? G. and H.—

"Super-Vac" vacuum cleaners—address for? S.W.B.—

29 Oct.—Heston and Isleworth B.C. Rewiring, supply and fixing of power outlets in: Contract 1, 92 houses; Contract 2, 102 houses; and Contract 3, 105 houses on Worple estate, Isleworth. Housing Officer and Manager, Housing Dept., Treaty Rd, Hounslow.—Advertised in this issue.

31 Oct.—Leighton Buzzard U.D.C. Erection of 28 Group "A" Stanton columns complete with lanterns/gear along A4012; resiting including the provision of new lanterns of 17 Group "B" columns and the erection of 33 additional Stanton columns/lanterns along Stanbridge Rd, C238. Engineer and Surveyor, Council Offices, North St. Deposit £2 2s.

31 Oct.—Oldham C.B. Conversion of 15 mechanical public clocks to electric drive or electric wind.—Advertised 29 Sept. issue.

4 Nov.—Down C.C. All-electric lighting and heating installation in Child Health and Welfare Clinic, Knocknee Ave, Kilkeel. Details from consulting engineers, Barrett and Agnew, 420 Ravenhill Rd, Belfast 6. Deposit £3.

5 Nov.—New Windsor B.C. Supply of (Item 15) lamps and (Item 21) fittings and cable for year to 31 Dec., 1961.—See 6 Oct. issue.

11 Nov.—New Windsor. Electrical installations in two maisonnettes at Clewer New Town. Borough Engineer, Kipling Bldg, Alma Rd.

14 Nov.—N.A.T.O. Infrastructure. Provision and proving of a very low-frequency radio-telegraph transmitting station in North of England. Applications to The Director, Post Office Contracts Dept. (A25), Telephone Hse, Temple Ave, E.C.4, by above date.—Advertised in this issue.

14 Dec.—Matlock U.D.C. Supply and installation complete of nine sewage pumps at four pumping stations in Darley Vale.—See 6 Oct. issue.

17 Nov.—Fylde Water Board. Supply of flow recorder panel and hydraulic measuring equipment. Engineer, Sefton St, Blackpool.—Advertised in this issue.

No date stated—Haddington B.C. (Item 6). Electrical installation in office reconstruction scheme at Caryle Rooms, Lodge St; and (Item 7) electrical work in 22 houses in seven blocks on Abercroft site. Details from Surveyors: R. T. B. Gilray, 60 Castle St, Edinburgh.

No date stated—N. of Scotland H.E.B. 60 MVA transformer for Persley substation, Aberdeen. Chief Electrical and Mechanical Engineer, 16 Rothesay Terr, Edinburgh 3.—Advertised in this issue.

No date stated—St. Faith's and Aylsham R.D.C. Supply of columns, lanterns, lamps and auxiliary equipment. Council Clerk, Tudor Hall, Rose La, Norwich.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

18 Oct.—Burma. Batteries (four items) up to 12 V 100 A in quantities up to 1,500. 7/·029 and 7/·036 single-core weatherproof cable. Two 30 h.p. motors and two starters for 20 h.p. motors. Director-General, Union of Burma Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/26078/9 and 80/60).*

20 Oct.—Jordan. Cables, boxes, cleats, bituminous compound and soldering compound. Jordan Phosphate Mines Co. S.A., P.O. Box 30, Amman. B.o.T. (ESB/26027/60/DLF).*

21 Oct.—New Zealand. 5,720 yd pilot cable, joint boxes, jointing compound and material. 9,240 yd of 0·3 0·35 sq in. 22 kV "H" type cable. Chairman, Auckland Electric Power Board, Queen St, Auckland, C.1. B.o.T. (ESB/24671 and 2/60).*

23 Oct.—Kuwait. 2,000 window type air-conditioning units. Department of Electricity, Kuwait. B.o.T. (ESB/24181/60).*

24 Oct.—India. Ten items, transformers, switches, lightning arresters and fuses for 33 kV substations. Chief Engineer, Electricity, Mysore State E.B., Post Bag 15, Bangalore 1. B.o.T. (ESB/26011/60).*

26 Oct.—Thailand. Three 1 MW generating sets. Thailand Tobacco Monopoly, 184 Sukumvit Rd, South Nana La, Bangkok. B.o.T. (ESB/24685/60).*

27 Oct.—America. Two autotransformers and one 3-ph 69 kV shunt capacitor. Dept. of Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center, Denver 25, Colorado. B.o.T. (ESB/25981 and 2/60).*

28 Oct.—New Zealand. Four items, resistors from 680 to 10,000 ohms fixed and adjustable in quantities of 50 and 100. Director-General (Stores Division), G.P.O., Wellington. B.o.T. (ESB/24675/60).*

1 Nov.—New Zealand. Six moving-coil 45-55 V d.c. 9 in. diameter volt meters. Director-General (Stores Division), G.P.O., Wellington. B.o.T. (ESB/24676/60).*

2 Nov.—India. One 20 ton o/h travelling crane with 6 ton auxiliary hoist. Director-General of Supplies and Disposals, Shahjahan Rd, New Delhi. B.o.T. (ESB/26012/60).*

7 Nov.—Australia. 132 kV double circuit galvanised steel tower transmission line for Kuringai substation loop. E.C. of N.S.W., Kelvin Hse, 15 Castlereagh St, Sydney. B.o.T. (ESB/24674/60).*

8 Nov.—Pakistan. Three 66 kV substations (excluding power transformers). Miner and Miner International Inc., P.O. Box 748, Greeley, Colorado, U.S.A. B.o.T. (ESB/26156/60/DLF).*

15 Nov.—Canada. Three 150,000 h.p. turbines for Grand Rapids. Mr D. M. Stephens, Chairman and General Manager, Manitoba H.E.B., P.O. Box 815, Winnipeg. B.o.T. (ESB/13924/60).*

15 Nov.—India. 97,000 c.f.m. induced draught fan for use with three B. and W. boilers. Assistant Engineer (Generation), Rajastan State Electricity Board, Jaipur. B.o.T. (ESB/26077/60).*

16 Nov.—Australia. Thirteen 22 kV o.c.b's. Secretary, Victorian Railways, Spencer St, Melbourne C.1. B.o.T. (ESB/25932/60).*

17 Nov.—India. 155 tons of 2½, 3½ and 5 mil cable insulating paper. Details, fee 10s, from C.D.N. Branch, India Store Dept., Bromyard Ave, W.3. Reference 1221/60 (CDN).

15 Dec.—Malaya. Two 10 MW turbo-alternators and auxiliaries for C.E.B. Johore Bahru Power Station. Précis (documents fee £15), from Crown Agents, 4 Millbank, S.W.1. Reference E.E. 1737/1.

CONTRACTS PLACED

Bridport B.C. North Allington Group "B" street lighting installation, A.E.I. Lamp and Lighting Co. Ltd., £2,236. Recommended.

Dorchester B.C. Installation of 28 Group "A" columns and removal of redundant equipment along Weymouth Ave and Trinity St, A354, Abacus Municipal Ltd.

Durham C.C. Electrical work in schools: New Lambton County School, R. Robson, £1,262; Egglescliffe new modern school, Cox-Walkers Ltd., £6,384; Neville's Cross Training College and Easington Technical College, North of England Engineering and Electrical Co., £9,316 and £17,648, respectively; Brancepath Nursery School, Bishop Auckland Barrington C.E. School and Spennymoor new dental clinic, James Paterson and Co., £421, £957 and £440, respectively; Peterlee Dene Hse Modern School, T. Mitchelson (Electrical) Ltd., £7,914; Washington Grammar Technical School, Devereux Moodie and Co. Ltd., £420. Recommended.

London C.C. Electrical installation improvement and renewal at Harwood County Primary School, L. Power and Son Ltd., £2,588 2s.

Northumberland C.C. Electrical installation in Whitley Bay Fire Station £30,000 extension, Robson and Coleman Ltd.

Ripley U.D.C. Supply, erection and wiring of Group "A" columns along B6347, Belper Rd, Midland Lighting and Bldg Ltd., £1,129. Recommended.

Southampton B.C. Electrical installation renewal at Soringhill R.C. School, G. Brough, £955. Recommended.

South Shields T.C. Rewiring of St. Bede's R.C. Primary School, A. J. Wares Ltd., £1,098; electrical work in further instalment of South Shields Marine and Technical College, C. Ramsay and Son, £29,310. Recommended.

Stockton-on-Tees T.C. Electrical installation in new Fairfield Infants' School, Cox-Walkers Ltd., £1,866. Recommended.

Walthamstow B.C. Electrical installation in 16-18 Prospect Hill, Woodford Electrical Co., £1,625. Recommended.

Withernsea U.D.C. Supply and erection of 65 60 W sodium lamps/lanterns/gear on 15 ft concrete columns, A.E.I. Lamp and Lighting Co. Ltd., £1,504.

TRADE NOTES

Change of Addresses. The north-west area offices of the Electric Construction Co. Ltd., and E.C.C. (Moulded Breakers) Ltd., is now at Bushbury Hse, 435 Wilmslow Rd, Wichington, Manchester 20. Telephone Didsbury 8761. Area Manager of Electric Construction is Mr J. H. Charnley, and North of England sales manager of E.C.C. (Moulded Breakers) is Mr J. T. Jolley.

As from 14 Oct. the Production, Inspection and Test Section (Newcastle Region) of the C.E.G.B. will move to 31 Mosley St, Newcastle upon Tyne. The telephone number remains 20610.

New 'Phone No. The telephone number of Belling and Lee Ltd. has been changed to Enfield 5393.

E.W.F. Ellistons (Welwyn) Ltd., 17-21 Brownfields, Welwyn Garden City, have been elected members of the Electrical Wholesalers Federation.

Agreements. Bristol Aerojet Ltd. and Permali Ltd. have entered into an agreement whereby the two companies will collaborate in the manufacture and sale of tubular structures of helically wound glass-fibre rovings bonded with synthetic resin. Bristol aerojet are to manufacture, and Permali will undertake sales.

An agreement has recently been signed between Smiths Industrial Division and the ABEM Co., Stockholm, each company having appointed the other as sole distributor of their high speed pen recording and laboratory equipment in specified areas. Smiths Industrial Division will be sole distributors of ABEM recording equipment in the U.K., U.S.A., the Commonwealth and certain territories in Europe, whilst ABEM Co. will be sole distributor of Kelvin Hughes recording equipment in Sweden, Norway, Denmark and Finland.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Hipac. 800,650. Class 9. Capacitors Ltd., 204-224 Soho Hill, Handsworth, Birmingham 19.

Lucifer. 799,590. Class 9. Solenoid-operated valves. Lucifer S.A., 14 Route de St. Julien, Carouge-Geneva, Switzerland.

Vedette Compact. 805,293. Class 7. Washing machines, etc. Societe Surmelec, 74 rue de Surmelin, Paris, France.

BUSINESS PROSPECTS

Alnwick. B. H. Brown (Engineering), 22 Main Rd, Kenton, Bank Foot, Newcastle, plan agricultural machinery servicing depot on industrial estate.

Andover. Wessex Hospital Board, Romsey Rd, Winchester, plans out-patients' dept. at Andover War Memorial Hospital at £30,000.

Ashton-under-Lyne. George Nixon and Co., Good Hope Mills, plan Brook St works extensions.

Beddington and Wallington. Vincent Burr and Ptnrs, 84 Gower St, W.C.1, recommended architects for building on Grange Mansion site for receptions.

Belfast. The Northern Bank, Victoria St, plan £200,000 bank building in High St.

Belford. Turley and Associates, 46 Jesmond Rd, Newcastle, architects for R.D.C.'s plan for council offices, Burnside estate.

Billingham-on-Tees U.D.C. Elder and Lester, Midland Bank Chmbrs., Town Sq, Billingham, architects for £¼ million shopping centre scheme.—**T.C.** Plan 1,293 houses on four sites in district. Engineer.

Blackburn. Park Bros., Bankfield Wks, plan Gate St factory.

Bradford T.C. Lighting improvement in overhauling workshop, Thornbury Wks, at £3,000. — £68,700 modernisation of 454 houses Odsal estate planned involving provision of light points in toilets and five power points in each house.

Brighton. Westminster Construction Co., 36 Westminster Palace Gdns, S.W.1, contractors for Waterloo Pl offi.e block planned by C. and G. Finance Corporation.

Bristol. R. Beecroft and Ptnrs, 11 Orchard St, Bristol 1, architects for General Business Services (Bristol) Ltd.'s new offices.

Bromsgrove. Ministry of Works (Architects' Dept., John Islip St, S.W.1) plan Stoke Heath airfield site prison.

Chatham. Farms and Ptnrs, 24 Welbeck Way, W.1, plan New Rd printing works. —**B.C.** Tender: 25 flatlets, Wayfield Rd. Engineer and Surveyor.

Chesterfield T.C. A61 trunk road lighting scheme at £6,476 planned. Surveyor.—£5,459 conversion of gas street lighting to electricity. Engineer.

Corby. Old people's home off Gainsborough Rd plan at £45,000. Architect.

Coventry. Norton Hill Estates Ltd. plan 96 flats in three-storey construction at Walsgrave.—J. Poulton (Ascot) Ltd., plan 30 Yewdale Cres houses.

Croydon. S.E.E.B., 10 Queen's Gdns, Hove, plan Factory La workshops, stores, etc.—Standard Printing Co., Purley Rd, plan printing works extensions.—Warner and Son, Vulcan Way, New Addington, plan factory extensions.—**B.C.** Stage 3 of improved lighting scheme planned for 29 streets at £17,000.

Deal. Sir James Miller and Ptnrs, 7 Suffolk St, S.W.1, plan scheme for 300 flats, supermarket, etc., on site of Walmer Pl.—Jackson and Jackson, 149 Sandgate Rd, Folkestone, architects for 12 flats Dover Rd.

Deben (Suffolk). Melton Grange Property Co. plan development of 18-acre site rear Melton Grange Hotel, Pytches Rd.

Dewsbury. Seven-storey shop and office block at Wakefield Rd planned by M. Harrison and Co., Farnley, Leeds.

Douglas I.o.M. Quiggin and Co. plan rebuilding of sawmill, etc., at Lake Rd.

Durham. K. Dancer, 14 Hagley Rd, Stourbridge, Worcs, architect for Richmond Sausage Co.'s planned additions to Gilesgate Moor Bakery. — **C.C.** New child welfare centre at Winlaton planned. Architect. **C.C.** Tender: High Coniscliffe County Junior and Infant School, maternity and child welfare centre at Newton Aycliffe and alterations at Frosterley South County School. Architect.

Eastbourne. Trustees of the Chatsworth Settlement plan new home for aged.

Edmonton, N. Stinehill Furniture Co. plan factory and offices at Angel Factory Colony

Elstree P.C. £1,370 Barnet La lighting scheme planned.

Ennerdale. John Laing and Son, Dalston Rd, Carlisle, contractors for 113 houses at Whitecroft, Gosforth; and 12 bungalows at Egremont.

Essex C.C. Tender: Colchester Pettygate County Infants' School at £42,000. Architect.

Farnborough. Daniel T. Jackson Ltd., Roebuck Rd, Hainault, Essex, plan development of Cove Brook land for up to 1,500 dwellings and shopping centre, etc.

Gateshead E.C. Tender: £170,000 extension to Technical College, Borough Engineer.

Glenrothes (Fife). Bechman Instruments, Queensway Industrial Estate, plan £100,000 addition to their new town factory.

Grimsby R.D.C. Class A lighting planned along Louth Rd and Pywwipe Rd. Surveyor.

Guildford. C. Brewer and Sons, Old Palace Rd, Croydon, plan buildings on Woodbridge Meadows industrial estate.

Hastings. Hallmark Group, 26 Regency Sq, Brighton 1, plan 150 dwellings, Old Roar Farm.—Thorburn Muirhead and Ptnrs, St. Leonards-on-Sea, plan 22-storey block of 145 flats, restaurant, etc., on site of Grand Hotel. Architect: Thomas Sibthorpe, 10 Manchester Sq, W.1.

Havant and Waterloo U.D.C. Tender: 12 flats in two blocks and one bungalow, Fairfield Rd. Engineer and Surveyor.

Hemel Hempstead. C. Miskin and Sons, Romelands, St. Albans, Herts, contractors for £26,000 foundry extensions for Hemel Hempstead Engineering Co.

Hyde B.C. Tender: Lilly St housing estate to comprise 32 houses, 20 maisonnettes and 20 flats. Surveyor.

Leeds T.C. Tender: 86 bungalows and 10 houses at Cardigan La, Moorside, Belle Isle and Gipton. Architect, Priestley Hse, Quarry Hill.

London. Llewellyn Smith and Waters, 103 Old Brompton Rd, S.W.7, architects for £100,000 modernisation of offices of Inde Coope and Allsopp, Cannon Brewery, Finsbury, E.C.1.—Dawneys Ltd. plan first stage of three-storey and final stage of ten-storey administrative block, York Rd, S.W.—Stock, Page and Stock, 3 Fanshaw St, N.1, architects, plan new warehouse and office accommodation in Goodwood Rd, S.E.14.—Ellis, Clarke and Gallannaugh, 37 Soho Sq, W.1, plan office block on site of Hackney Empire Music Hall, Mare St, E.—R. Seifert and Ptnrs, 28 Gt. Ormond St, W.C.1, architects for £800,000 development on behalf of Oldham Estates for three seven-storey blocks, E.C.—L. C. Morton, 4 St. George St, W.1, architects for three-storey building planned for 1-4 Hatton Gdn, E.C.1.—H. Fitzroy Robinson, 3 Gray's Inn Sq, W.C.1, architects for 33-storey building on Esso site at 80-85 Albert Embankment.—Devereux and Davies, 3 Gower St, W.C.1, architects for Landfranc Holdings' Westminster Bridge Rd offices, S.E.1.—H. Owen Luder, 79 Regency St, S.W.1, architect for multi-storey block shops and offices, Catford Rd, Lewisham, S.E.—F. J. D. Daley, 45 Blackfriars Rd, S.E.1, architect for multi-storey block on site 217-230 Blackfriars Rd, S.E.1.

Manchester T.C. Tender: Contract 352, 42 dwellings, Miles Platting; and 354, 229 dwellings, Collyhurst. Director of Housing. —Home for aged planned in Goodier St, Harpurhey, at £66,964.

Meltham U.D.C. Lighting scheme planned at £2,057.

Middlesbrough. J. T. Bell and Sons plan development of site of Old Merchant Navy Club, Borough Rd; eight-storey building containing conference suites, offices, etc.

Newbury. Gunton and Gunton, Empire Hse, St. Martins-le-Grand, E.C.1, architects for West St office block for Rishton Management Ltd.

Newcastle. Corporation plans £¼ million terminal buildings extensions at Woostington Airport. Engineer.—Also £1¼ million Scotswood Rd abattoir.

New Sarum T.C. Tender: Ten houses, four flats, Stratford Rd, Salisbury. Engineer.

Northumberland. C.C. plan welfare homes at Berwick and Ashington at £146,500 and Merley Court, Morpeth, £51,000. Architect, Newcastle.

Oxford. Architects' Dept., Ministry of Works, Abell Hse, John Islip St, S.W.1, prepared plans for £190,000 radio station planned at Leafield.

Peterborough T.C. Electrical heating planned for roadway surface at junction of Bridge St and Embankment Rd. Engineer.

Pontypridd. Pontypridd and Rhondda Hospital Management Committee plan £600,000 scheme for redevelopment of Graig Hospital.

Redcar T.C. £100,000 scheme for Zetland Park ballroom planned. Engineer.

Rotherham. Pearl Assurance Co., High Holborn, W.C.1, plan office block on Ship Hill.

St. Albans T.C. Tender: 48 houses, Jersey Farm estate. Engineer and Surveyor.

Scunthorpe B.C. Tender: 14-storey block of 79 flats, Westcliffe estate. Clerk.

Sedgeley. Bighton and Sons, 25 Oakham Fields, Dudley, Worcs, plan engineering factory on Dormston trading estate.

Sheffield. Regional Hospital Board, Fulwood Hse, Old Fulwood Rd, plans hospitals at Ashgate, Chesterfield and at Oakwood Hall, Rotherham.

Southall. Tooley and Foster, Midland Bank Chmbrs, Buckhurst Hill, Essex, architects for £130,000 extensions to St. Bernard's Hospital.

Southend-on-Sea. Derek Silverton, 79 High St, Southend, architect for seven-storey block of 130 flats, Priory Cres, Prittlewell. —Talbot and White, 34 Clarence St, surveyors for 15-storey block of 95 flats on site of Imperial Hotel, Westcliffe.

South Shields. Newcastle Hospital Board tender: two-storey corridor to link two wards at South Shields General Hospital, George H. Gray and Ptnrs., 52 Camden St, North Shields.

S. Wales. £10 million chemical plant planned by British Hydrocarbon Chemicals Ltd. on site near Llandarcy.

Sunderland B.C. Tender: Major extensions to training college; four-storey hostel block; two-storey teaching block and one-storey communal block and alterations to existing premises. Architect, Grange Hse, Stockton Rd. Tender: 204 dwellings at Hylton Red Hse estate. Architect.

Sutton and Cheam. M. J. Gleeson, London Rd, Cheam, plans 96 flats at Cheam Rd.

Thetford. Corporation plans third block of nine-unit factories on industrial estate.

Tottington. Kirklees Ltd. plan factory extensions.

Trowbridge. McCall Bros., Upper Mills, Trowbridge, plan Cradle Bridge Mill new factory building.

Twickenham. Richardson and Houfe, 24 Queen Anne St, W.1, architects for science block, assembly hall, etc., at St. Mary's College, Strawberry Hill.

Tynemouth. Fennell and Baddiley, Bridge End Chmbrs, Chester-le-Street, architects for factory extensions at Pallion for Industrial Estates Corporation of England, Team Valley, Gateshead.

Wallsend. T.C. plans 20 old people's houses on village green and four at Low Willington Farm at £32,000.

Wem U.D.C. Tender: Two three-storey blocks of flats of 30 units, 18 houses. Architects: Biggins and Assoc., Richmond Hse, 123 Boughton, Chester.

Weston-super-Mare T.C. Tender: Two factories with offices at Oldmixon industrial estate.

Whitley Bay. R. A. Gofton and Sons, Front St, Monkseaton, contractors for Stephens Manufacturers' factory extensions.

Wigston U.D.C. Conversion of gas street lamps to electricity at £14,000 planned.

York. Leeds Hospital Board, Harrogate, plans 500-bed hospital at Bootham.

GAZETTE ANNOUNCEMENTS

BANKRUPTCY ACTS

Receiving Orders

Birmingham. S. L. R. Suckling, plumbing and electrical contractor, carrying on business as Aquatherma, at 2 Chelmsley Grove, Tile Cross, Birmingham 33. Receiving order dated 30 Sept.

Slough. R. G. Daniels, electrical retailer, carrying on business as Hayden Television, at 51-53 Oxford Rd, Windsor. Receiving order dated 4 Oct.

First Meetings and Public Examinations

Southend. Cirex Appliances, electrical distributors, of 3 Westminster Bldgs, 733 London Rd, Westcliff-on-Sea. First meeting: 12 noon, 13 Oct., at 58-61 York Terr, Regent's Pk, N.W.1; and public examination: 11 a.m., 22 Nov., at 102 London Rd, Southend-on-Sea.

Gloucester. A. C. J. Franklin, electrical engineer, of 142 Southgate St, Gloucester. First meeting: 10.30 a.m., 13 Oct., at Official Receiver's Office, 26 Baldwin St, Bristol; and public examination: 11 a.m., 14 Nov., at Shire Hall, Gloucester.

Barnstaple. G. H. Cornwell, electrical retailer, carrying on business at 21 Rockmount, Pitt La, Bideford. Public examination: 2.15 p.m., 6 Dec., at The Guildhall, Barnstaple.

Bolton. N. Pilling, electrical contractor, carrying on business at 48 Bury Rd, Radcliffe. Public examination: 10.30 a.m., 14 Dec., at Court Hse, Mawdsley St, Bolton.

Derby. K. King, electrical contractor and retailer, carrying on business at 71 Mansfield Rd, Alfreton. Public examination: 10 a.m., 22 Nov., at Court Hse, 20 St. Peter's Church Yard, Derby.

Stafford. A. Owen and L. G. A. Shaw, electrical contractors, formerly carrying on business as Owen and Shaw, at Corner Shop, Cross Rds, Hixon. First meeting: 11 a.m., 18 Oct., at Official Receiver's Office, 12 Lonsdale St, Stoke-on-Trent; and public examination: 2 p.m., 2 Dec., at The Guildhall, Stafford.

Release of Trustee

Wolverhampton. L. Stanyer, electrical fancy goods dealer, etc., carrying on business at 552 Dudley Rd, Wolverhampton. Trustee: R. F. Bendall, 126 Colmore Row, Birmingham, released as from 5 Aug.

Intended Dividend

Bradford. M. R. Dixon, plumber and electrical contractor, formerly carrying on business at 792 Leeds Rd, Bradford. Last day for receiving proofs for intended dividend: 18 Oct., to trustee: G. E. Rushton, 36 North Parade, Bradford 1.

COMPANIES ACTS

J. A. Phillips (Electrical) Ltd. Meeting of creditors to be held at W. H. Cork, Gulley and Co., 19 Eastcheap, E.C.3, on 26 Oct., at 12 noon.

Croydon Electrical Co. Ltd. Mr J. J. Wrench, 17 Bedford Row, W.C.1, and Mr G. A. Wale, Walter Hse, 418-422 Strand, W.C.2, appointed liquidators on 26 Sept., for the purpose of winding-up.

Electroservice (R. W. Taylor) Ltd. Petition for winding-up to be heard before the Royal Courts of Justice, Strand, W.C.2, on 17 Oct. Persons intending to appear to notify Thornton Lynne and Lawson, 56 Portland Pl, W.1, by 1 p.m., 15 Oct.

Advance Domestic Appliances Ltd. Mr A. Strudwick, 75 Agincourt Rd, N.W.3, appointed liquidator at extraordinary general meeting on 21 Sept. for the purpose of voluntarily winding-up.

Blickvac Eng. Ltd. Meetings of members and creditors to be held at 28 West Sunniside, Sunderland, on 1 Nov., at 2 and 2.30 p.m., respectively.

MEETINGS TO NOTE

THURSDAY, 13 OCT.

I.E.E. (Utilisation Section). Chairman's address, "Developments in Electrical Plant for Industry," J. M. Ferguson. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (Southern). "The Measurement of Time," L. Essen. S. Dorset Technical College, Weymouth. 6.30 p.m.

I.E.E. (West Wales). Chairman's address, J. Nelsey. Conference Room, S. Wales Electricity Board, Kingsway, Swansea. 6 p.m.

I.E.E. (Southern Graduates and Students). Chairman's address, "A Review of Modern Computing Elements," R. E. Hayes. The University, Southampton. 6.30 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (S. Western). "Introduction to Milwaukee-Matic," A. Tack. Technical College, Brunswick Rd, Gloucester. 7.30 p.m.

COUNCIL FOR PRESERVATION OF RURAL ENGLAND. National Conference for Preservation of the Countryside at Weymouth until 15 Oct.

FIRST ELECTRICAL ENGINEERS' EXHIBITION DINNER. Grosvenor Hse, London.

A.S.E.E. (Bradford and District). "Further Discussion on the I.E.E. Regulations," J. L. Browell and H. F. Smith. Midland Hotel. 7.30 p.m.

A.S.E.E. (S.W. London). "Recent Developments in Luminescent Light Sources." Thorn Hse, Upper St. Martin's La, W.C.2. 8 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Teesside). The Errors of Instruments—Their Study and Importance," H. Kenney. Cleveland Scientific and Technical Institute, Corporation Rd, Middlesbrough. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Liverpool). "Any Questions." M.A.N.W.E.B. Industrial Development Centre. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Control Section). "Transistor Switches in Monitor and Control Systems," W. A. Ross. Manson Hse, 26 Portland Pl, W.1. 7 p.m.

I.E.S. (Manchester). "Lighting Journey Down the Rhine," E. J. Smith. Demonstration Theatre of N.W.E.B., Town Hall Extension, Manchester 2. 6 p.m.

FRIDAY, 14 OCT.

I.E.E. (N. Staffs). Joint annual dance. Crown Hotel, Stone. 8.30 p.m.

E.P.E.A. (Meter Engineers' Technical Group). "The Post-War Organisation of the Electricity Supply Industry," A. M. F. Palmer. Caxton Hall, S.W.1. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Midlands). "Fundamentals of Temperature Measurement," E. B. Jones. Lecture Theatre of the Byng Kendrick Suite at the Gosta Green College of Technology, Aston St, Birmingham. 7 p.m.

JUNIOR INSTITUTION OF ENGINEERS. "Nuclear Fuels," Robin F. W. Guard. Pepys Hse, 14 Rochester Row, S.W.1. 7 p.m.

SATURDAY, 15 OCT.

A.S.E.E. (Liverpool and District). Dinner/dance. Mecca Restaurant, Exchange St East.

MONDAY, 17 OCT.

I.E.E. (Mersey and N. Wales). "Short-circuit Ratings for Mains Cables," G. S. Buckingham and "A Basis for Short-circuit Ratings for Paper-insulated Cables up to 11 kV," L. Gosland and R. G. Parr. Town Hall, Chester. 6.30 p.m.

I.E.E. (N.E. Measurement and Electronics Group). Chairman's address, E. D. Taylor. Rutherford College of Technology, Newcastle. 6.15 p.m.

I.E.E. (Scottish Electronics and Measurement Group). Chairman's address, J. Stewart. Institution of Engineers and Shipbuilders, 39 Elmbank Cres, Glasgow. 6 p.m.

I.E.E. (N. Staffs). "The Shielding of o/h Lines Against Lightning," J. H. Gridley. County Technical College, Stafford. 6.30 p.m.

I.E.E. (W. Supply Group). Chairman's address. Demonstration Theatre, Electricity Hse, Colston Ave, Bristol 1. 6 p.m.

I.E.E. (London Graduates and Students). Chairman's address. Unit Cinema, 3 (Tels) Trng Bn, R.E.M.E., Arborfield, Berks. 7 p.m.

I.E.E. (Reading). "The Development of m.c.b's for Circuit and Earth Leakage Protection," J. A. Robbins. George Hotel, King St, Reading. 7.15 p.m.

BIRMINGHAM ELECTRIC CLUB. "Electric Traction," J. A. Broughall. Grand Hotel. 6.15 p.m.

A.S.E.E. (Bristol and West). "The Story of the Time Clock," J. Key. Royal York Hotel, Bath. 8 p.m.

TUESDAY, 18 OCT.

I.E.E. (N. Midlands Utilisation Group). "The Design of Electromagnetic Pumps for Liquid Metals," D. A. Watts. Leeds and County Conservative Club, South Parade, Leeds 1. 6.30 p.m.

I.E.E. (Measurement and Control Group). "Development of the Formulae of Electromagnetism in the M.K.S. System." P. Vigoureux. Engineers' Club, Manchester. 6.15 p.m.

I.E.E. (S.E. Scotland). Sub-centre chairman's address, I. S. Fraser. Carlton Hotel, North Bridge, Edinburgh. 7 p.m.

SOCIETY OF RELAY ENGINEERS. "Picture Quality Control Equipment for Wired Television Networks," B. W. Osbourne. 21 Bloomsbury St, W.C.1. 2.30 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Arnold Jackson Ltd., "Linden," Shorter Ave, Shenfield, Essex. To carry on business of electricians, dealers in electrical apparatus, etc. Nom. cap.: £100. Dirs.: John R. Arnold and James S. Jackson.

British Insulated Cables Ltd., Norfolk Hse, Norfolk St, W.C.2. Nom. cap.: £2. Dirs.: James P. Hourston and Jesse J. Flood.

Clough Brothers (Wyke) Ltd., 46 Towngate, Wyke, Bradford. Electrical, radio and television dealers, etc. Nom. cap.: £3,000. Dirs.: Walter P. Clough, Mrs Gwendoline Clough and Arthur V. Clough.

Cranborne Electric Co. Ltd., 94 Smithdown Rd, Liverpool. Nom. cap.: £600. Dirs.: George Easthope, Walter A. Glass and George H. Hamblett.

Darstan Ltd., 26 Rayleigh Rd, Thundersley, Essex. Electrical engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: Frank W. Standing and Walter Standing.

General Electrodynamics Co. (of Texas) Ltd, 6 Gate St, W.C.2. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £100. Dirs.: to be appointed by subscribers. Subs.: Hetty Lyons and Geoffrey L. Isaacs.

Alan H. Hayter Ltd., 3 Chepstow St, Manchester 1. Dealers in electrical goods, etc. Nom. cap.: £100. Dirs.: Alan H. Hayter, Cecilia G. Hayter and Herbert W. Hayter.

S. A. Moss Ltd., 67 Long St, Atherstone, Warwicks. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £1,000. Permanent dirs.: Samuel A. Moss and Velma I. Moss.

Northern Electrical Connections Ltd., 31 Booth St, Ashton under Lyne, Lancs. Manufacturers of and dealers in electrical connections for the engineering industry, etc. Nom. cap.: £100 in £1 shares. Dirs.: Frank Newton, Henry V. Hird and Charles S. Douglas.

Smith's Electric (Enfield) Ltd., 134 Chase Side, Enfield, Middx. Nom. cap.: £2,000. Dirs.: Laurence Smith and George Smith.

Streeter and Sparks Ltd., Fern Cottage, Sandy La, West Hoathly, Sussex. Electrical engineers, etc. Nom. cap.: £100. Dirs.: Jesse J. Streeter, Claude A. Sparks and Ronald J. Streeter.

United Power Co. Ltd. To design, develop, assemble, construct, manufacture and supply nuclear reactors and components, etc. Nom. cap.: £100,000. Dirs.: not named. Subs.: Russell F. Syder, Magnet Hse, Kingsway, W.C.2; and Walter L. Adams, 28 Theobalds Rd, W.C.1.

Meetings to Note—continued

INSTITUTION OF CIVIL ENGINEERS. "Zambesi H.E. Development at Kariba: First Stage," Sir Duncan Anderson, T. A. L. Paton and C. L. Blackburn. Gt. George St, S.W.1. 5.30 p.m.

A.S.E.E. (Oxford and Districts). "Industrial Electrical Safety," F. Galloway. Employment Exchange, 8 p.m.

WEDNESDAY, 19 OCT.

I.E.E. (Supply Section). Chairman's address, "The Developing Engineer," J. E. L. Robinson. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (Sheffield). Chairman's address, "Electrical Contracting in Commerce and Industry," E. J. Lilleker. Grand Hotel. 6.30 p.m.

I.E.E. (N. Lancs). "Some Considerations in the Application of Power Rectifiers and Converters," J. P. McBreen. N.W.E.B. Demonstration Theatre, Duke St, Barrow. 7.15 p.m.

I.E.E. (S.W. Scotland). Sub-centre chairman inauguration and "A Basis for Short-circuit Ratings for Paper-insulated Cables up to 11 kV," L. Gosland and R. G. Parr. Institution of Engineers and Shipbuilders, 39 Elmbank Cres, Glasgow. 6 p.m.

I.E.E. (Southern). "A Survey of Street Lighting and its Future," W. R. Stevens and H. M. Ferguson. Technical College, Brighton. 6.30 p.m.

I.E.E. (Southern). "Thermistors—Their Theory, Manufacture and Application," R. W. A. Scarr and R. A. Setterington. Christchurch 6.30 p.m.

I.E.E. (S. Western). Chairman's address, F. C. Isaac. Plymouth "B" Generating Station, Plymouth. 3 p.m.

I.E.E. (Rugby Graduates and Students). "Transistor Amplifiers," M. W. Dobson. Rugby College of Engineering Technology. 6.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (S. Wales). "The Use of Transistors in Pulse Circuitry," A. R. Owens. Welsh College of Advanced Technology, Cardiff. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Newcastle). "Noble Metal Thermocouples," J. A. Stevenson. The Conference Room, Roadway Hse, Oxford St. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Bristol). "Characteristics of Differential Producers for Flow Measurement," H. E. Dall. University of Bristol, Dept. of Physics, The Royal Fort. 7.30 p.m.

A.S.E.E. (Nottingham). "Modern Store Lighting," J. R. Just. Nottingham Mechanics' Institution, Trinity Sq. 7.30 p.m.

A.S.E.E. (Wolverhampton and District). "Breakdown of Electrical Equipment—Some Remedial and Insurance Aspects," F. E. Noakes. Chamber of Commerce, District Bank Chmbrs, Lichfield St. 7.45 p.m.

THURSDAY, 20 OCT.

I.E.E. (N. Midlands). "The Supply Authorities' Problems," H. Anderson; "The Consultants' Problems," C. H. Nicholson; and "The Users' Problems," A. Minty. Lecture Theatre, Y.E.B. Offices, Ferensway, Hull. 6.30 p.m.

CHELMSFORD ENGINEERING SOCIETY. "Introduction to the Age of Nuclear Power," W. G. Busbridge. Social Hall, Crompton Parkinson. 7.30 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (Scotland). "Process Planning and Machine Tool Control Systems," A. Tack and J. Brett. Institution of Engineers and Shipbuilders, 39 Elmbank Cres, Glasgow. 7.30 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (Southern). "Equipment Peripheral to Digital Computers," E. J. Petherick. Polygon Hotel, Southampton. 7.15 p.m.

I.E.E. (Cambridge Electronics and Measurement Group). "Frequency Variations of Quartz Oscillators and the Earth's Rotation in Terms of the N.P.L. Caesium Standard," L. Essen, J. V. L. Parry and J. McA. Steele. Cavendish Laboratory. 8 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (E. Midlands). "Instrumentation at the British Railways Research Department, Derby," J. H. Littlewood and A. Kettlety. University, Leicester. 7.15 p.m.

FRIDAY, 21 OCT.

I.E.E. (Southern). "The Application of Irradiation in Industry," M. C. Crowley-Milling. S.E.B. Showrooms, Newport, I.W. 6.30 p.m.

I.E.E. (W. Wales). Annual dinner/dance. Langland Bay Hotel, Swansea. 7.30 p.m.

BIRMINGHAM ELECTRIC CLUB. Annual dinner. Grand Hotel.

JUNIOR INSTITUTION OF ENGINEERS. "Boiler Management in Small Plants," L. Clegg. 14 Rochester Row, S.W.1. 7 p.m.

A.S.E.E. (Aldershot and Districts). Dinner/dance. Victoria Hotel.

A.S.E.E. (Liverpool and District). "Nuclear Power and Propulsion," R. V. Moore. Lecture Theatre, Chadwick Physics Laboratory, Liverpool University. 7.30 p.m.

A.S.E.E. (Stoke and Crewe). "Silicones and Their Applications in the Electrical Industry," J. H. Davis. Grand Hotel, Hanley. 7.30 p.m.

MONDAY, 24 OCT.

I.E.E. (E. Anglian). "Electrical Installation Practice," E. J. Sutton. Electric Hse, Ipswich. 6.30 p.m.

I.E.E. (N. Eastern). "Safety in the Utilisation of Electricity," S. J. Emerson. Neville Hall, Westgate Rd, Newcastle. 6.15 p.m.

I.E.E. (N. Western). Discussion, "Selection of Students for Appropriate Courses." Bolton Technical College. 6.15 p.m.

I.E.E. (S. Midlands Electronics and Measurement Group). "Automatic Control of Machines for Assembling Bicycle Parts," A. V. Hemingway and R. L. Dressler. James Watt Memorial Institute, Birmingham. 6 p.m.

I.E.E. (W. Utilisation Group). Chairman's address, "Developments in Electrical Plant for Industry," J. M. Ferguson. S. Wales Institute of Engineers, Park Pl, Cardiff. 6 p.m.

I.E.E. (Sheffield). Chairman's address, "Electrical Contracting in Commerce and Industry," E. J. Lilleker. Angel Hotel, Brigg. 7 p.m.

I.E.E. (N.W. Graduates and Students). "A.C. and D.C. Variable Speed Drives, E. Hall. Electrical Engineering Department, Manchester University. 7 p.m.

I.E.E. (London Graduates and Students). Chairman's address. "Southern Region, Kent Coast Electrification Scheme—Power Supply Apparatus." Savoy Pl, W.C.2. 6.30 p.m.

TUESDAY, 25 OCT.

I.E.E. (Measurement and Control Section). "Rapid Methods for Ascertaining Whether the Activity of a Weak Radioactive Sample Exceeds a Predetermined Level," E. H. Cooke-Yarborough and R. C. M. Barnes. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (N. Eastern). "Safety in the Utilisation of Electricity," S. J. Emerson. Carlisle Technical College. 7 p.m.

I.E.E. (N.W. Supply Group). "Field Suppression of Turbo-alternators," J. R. Hill, A. Hunt, W. J. Joyce and D. H. Tompsett. Engineers' Club, Manchester. 6.15 p.m.

I.E.E. (S. Midlands Graduates and Students). "Stereophonic Sound," K. N. Hawke. Alfred Herbert Hall, Coventry. 7 p.m.

I.E.E. (N. Staffs Graduates and Students). Senior chairman's address, G. H. Gillam. Swan Hotel, Stafford. 7.15 p.m.

STERLING CABLE COMPANY LIMITED

Severe Competition Successfully Met

Record Current Order Book

Mr. James S. Clark on Need for Stable Home Market Conditions

THE 12th annual general meeting of Sterling Cable Company Limited was held on 10 Oct. in London, MR JAMES S. CLARK (chairman and managing director) presiding.

The following is his circulated address:

I have the pleasure to submit the Report of the Directors and the Accounts of the Company for the year ended 31 March, 1960.

The Group profit before tax was £53,129 compared with £105,344 last year. Income tax requires £24,628. The Group profit, after tax, is £28,501, out of which we have provided for Preference Share Redemption £5,577 and for the Preference dividend, less tax, £6,284. The recommended Ordinary dividend of 6½%, less tax, will require £16,124, leaving £516 to add to our carry forward, which now totals £68,890.

TRADING CONDITIONS

Last year I told you of the severe competition which had arisen in the industry. This competition rapidly intensified, to the point where the popular types of distribution and consumer cables were being offered at substantially below factory cost.

Steps which we had taken months before to combat this situation met with considerable success. Increased endeavour in markets not so badly affected enabled us to operate on an economic basis and show a final profit. This result reflects the greatest credit on our staff, who cheerfully and energetically worked to overcome the frustrations and difficulties associated with the rapid changes of programme and great flexibility which were necessary to produce a reasonable result in trading conditions which passed from order to chaos in a few months.

Enough has already been written about this undignified period in the industry's history. I earnestly hope and believe that the lessons learned will not easily be forgotten.

THE CURRENT YEAR

To turn to the present—our order book is larger than ever before and is balanced over an exceptionally wide range of cables for Export and Home markets. Prices, although not yet entirely adequate, are becoming more stable and there is every reason to believe that this year will show a return to the fair profit margins hitherto enjoyed. The whole experience of the past year will eventually prove that the prices charged by your Company have at all times been modest and reasonable.

Once again it is a privilege to thank a wide range of customers for the splendid support they have given us during this most difficult year. Their continued confidence gives us all great encouragement.

HOME AND EXPORT MARKETS

May I remind you of another aspect of unstable Home market conditions? As you know, we have at all times worked extremely hard and effectively in the Export market. Competition from European manufacturers continues to increase. This is not surprising. Their efforts are backed by a well-organised and profitable Home market. This enables them to devote practically all their attention to overseas sales promotion.

Unfortunately the exact opposite obtains in this country. Manufacturers are exhorted to devote the major portion of their attention to export fields but, at the same time, are faced by legislation which jeopardises and, in fact, temporarily destroys stability at home. The kaleidoscopic pattern emerging requires day to day concentration, and overseas effort and planning cannot receive its due priority.

I am convinced that a steady Home market is the essential prerequisite of an enterprising export policy. I hope the necessary stability may now, to some extent, be returning.

The report and accounts were adopted.

A single strainer of the type we supply to the C.E.G.B. handles five million gallons of water an hour . . . enough to maintain quite a spectacular waterfall. At Aberthaw Power Station there are six such units with a total capacity of 30,000,000 g.p.h. straining the condenser cooling water.

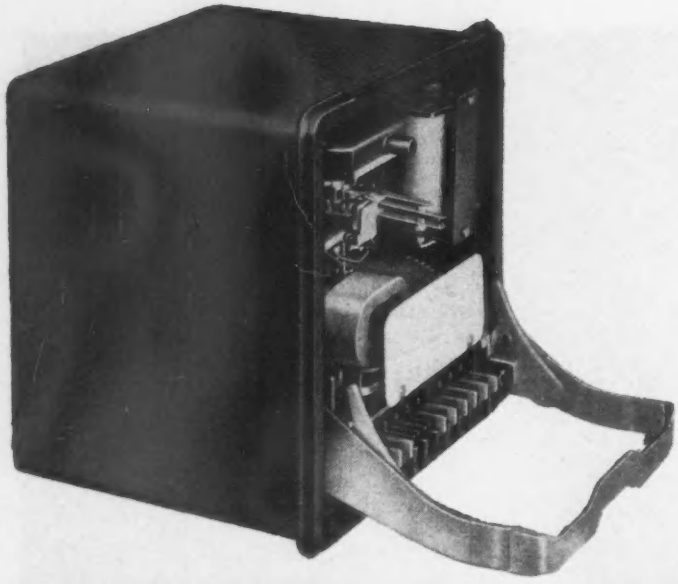
Richardsons Westgarth rotary strainers are made in a range of sizes from 160,000 g.p.h. to 5,000,000 g.p.h., they are self cleaning, operate continuously, and the accumulated sludge is blown out at intervals without interrupting the flow. *Please write for illustrated brochure.*

RICHARDSONS WESTGARTH (HARTLEPOOL) LTD.

A member of the RICHARDSONS WESTGARTH GROUP

HARTLEPOOL, CO. DURHAM AND AT 58 VICTORIA STREET, LONDON, S.W.1, 59 MOSLEY STREET, MANCHESTER, 75 BUCHANAN STREET, GLASGOW.

RW 59



DRAWOUT RELAYS BY

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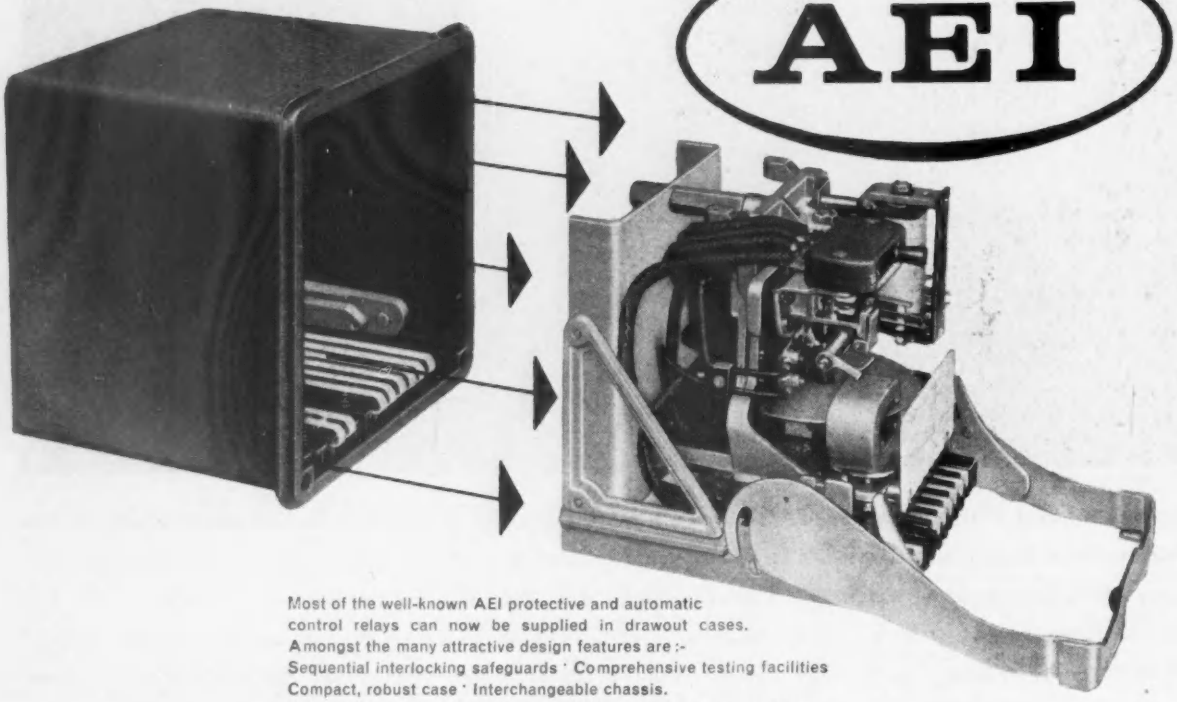

Most of the well-known AEI protective and automatic control relays can now be supplied in drawout cases. Amongst the many attractive design features are :- Sequential interlocking safeguards · Comprehensive testing facilities Compact, robust case · Interchangeable chassis. Full details are given in Publication 2205-1 available on request to :-

AEI **Associated Electrical Industries Ltd.**

Instrumentation Division—Instrument & Meter Department

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CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

FYLDE WATER BOARD

Weeton Reservoir Reconstruction

TENDERS are invited from suitable manufacturers for the supply of a Flow Recorder Panel and Hydraulic Measuring Equipment.

Further details, specification and form of tender can be obtained from Engineer to the Fylde Water Board, Sefton St, Blackpool.

Tenders must be returned not later than 17 Nov., 1960. (S 280)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

60 MVA Transformer for Persley Substation, Aberdeen

TENDERS are invited for the above Transformer, and tender documents may be obtained from the Board's Chief Electrical and Mechanical Engineer, 16 Rothesay Terr, Edinburgh 3, on receipt of a deposit of 2 gn (returnable). The Board do not bind themselves to accept the lowest or any tender. (S 279)

CITY AND COUNTY OF LICHFIELD

Group "A" Street Lighting, Sandford Street

TENDERS are invited for the supply, erection and installation of 15 Steel Columns together with Sodium Lanterns and ancillary equipment.

Application for Contract Documents should be made to the City Engineer and Surveyor, Mr D. Oglesby, M.I.MUN.E., Meredith Hse, 62 Wade St, Lichfield.

Applications must be accompanied by a tender of two guineas, which is returnable on receipt of a bona fide Tender not subsequently withdrawn.

Tenders in a plain sealed envelope endorsed "Street Lighting, Sandford Street" must be received by the undersigned not later than noon on Saturday, 22 Oct., 1960.

The City Council does not bind itself to accept the lowest or any Tender.

HENRY J. CALLENDER,
Town Clerk.

Guildhall,
Lichfield.
1 Oct., 1960. (S 300)

BOROUGH OF HESTON AND ISLEWORTH

REWIRING OF ELECTRICAL INSTALLATION SUPPLYING AND FITTING POWER POINTS

Worple Estate, Isleworth

TENDERS are invited for the rewiring of the electrical installation and supplying and fitting power points in Council houses on the Worple Estate, Isleworth, as follows:

Contract 1— 92 houses.
Contract 2—102 houses.
Contract 3—105 houses.

Forms of tender to be obtained from the Housing Officer and Manager, Housing Department, Treaty Rd, Hounslow.

Tenders in sealed envelopes not indicating the Tenderer endorsed "Worple Estate—Rewiring" must be delivered to me by 10 a.m. on 29 Oct., 1960.

The Corporation are not bound to accept any Tender.

D. MATHIESON,
Town Clerk.

Town Hall,
Hounslow, Middx. (S 281)

NATO COMMON INFRASTRUCTURE SLICE VI

1. FINAL notice is hereby given that it is intended to invite International Competitive Bids at the end of 1960 or early in 1961, for the design, provision and proving of a very-low-frequency radio-telegraph transmitting station, to be constructed on an already determined site of about 700 acres in the North of England.
2. The station is to be suitable for operation at (a) signalling speeds of approximately 45 bauds when radiating a power of about 100 kW at frequencies in the neighbourhood of 20 kc/s; (b) considerably higher signalling speeds when radiating at a somewhat lower power. Amplitude and angle modulation will be required.
3. The approximate value of the work will be £3,500,000 covering all internal and external radio equipment, power distribution and emergency generating plant, buildings, roads on site, etc.
   A tendering period of five months will be allowed and completion of the work within three years from the date of contract will be required.
4. It should be noted that the importation of labour from sources outside the United Kingdom may be subject to restriction, and permission could in any case be granted only on an undertaking that the Contractor would pay rates of wages and observe hours and conditions of labour not less favourable than those established for the United Kingdom labour for the trades or industries in the same area.
5. Firms wishing to be invited to bid should submit their requests by 14 Nov., 1960, to:

The Director,
Post Office Contracts Department (A25),
Telephone House,
Temple Avenue,
London E.C.4.

Within one week thereafter, such firms shall submit evidence of their financial, technical and production resources, and of their ability to provide the VLF station satisfactorily within the time limit stated in para 3 above; in particular, they should state their experience of large radio-station works. They should also state which major items of this particular work they would intend to subcontract. As far as is possible, the names, addresses and resources of the main subcontractors should also be given.

GENERAL POST OFFICE,
LONDON.
(S 282)

APPOINTMENTS VACANT

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

ASSISTANT STATION CHEMIST
Vacancy No. ET/138/60.

REQUIRED at Hinkley Point Nuclear Power Station.

Superannuation Scheme. Salary, provisionally within Scale 15 of the N.J.B. Agreement —£1,650/£1,830 p.a.

continued in next column

continued from previous column

Applications are invited for the position of Assistant Station Chemist at Hinkley Point Nuclear Power Station, Bridgwater, Somerset. Previous experience in a Power Station Laboratory is essential and candidates should preferably be Associates of the Royal Institute of Chemistry or hold an equivalent qualification.

Closing date: 24 Oct., 1960.

ASSISTANT SHIFT CHARGE ENGINEER
Vacancy No. ET/139/60.

Required at East Yelland Power Station.

Superannuation Scheme. Salary: N.J.B. Class H, Grade 9, Scale 8, £1,040/£1,165 per annum plus 10% for shift duties.

Applicants should possess good technical qualifications and should have had training and experience in the control and operation of modern steam generating plant and main switchgear.

Closing date: 24 Oct., 1960.

THIRD ASSISTANT ENGINEER
Vacancy No. ET/140/60.

Required in Maintenance and Co-ordination section, Maintenance and Operation Branch of the Divisional Electrical Department at Bristol.

Superannuation Scheme. Salary: N.J.B. Class AX, Grade 6, Scale 12, £1,285/£1,500 per annum.

Candidates must have had practical experience in the maintenance and/or construction of 132 kV and 275 kV overhead lines and should possess detailed knowledge of the equipment required to maintain and construct such lines.

The possession of qualifications leading to Corporate Membership of the Institution of Electrical Engineers and/or Mechanical Engineers will be an advantage.

The ability to drive a car is essential.

Closing date: 31 Oct., 1960.

THIRD ASSISTANT ENGINEER
Vacancy No. ET/141/60.

Required in the Protective Gear Section, Maintenance and Operation Branch of the Divisional Electrical Department at Bristol.

Superannuation Scheme. Salary: N.J.B. Class AX, Grade 8, Scale 10, £1,105/£1,325 per annum.

Applicants should possess qualifications leading to Corporate Membership of the Institution of Electrical Engineers and should have a keen interest in all forms of Transmission and Generating Plant protection. Experience in the application and testing of protective systems and a good knowledge of report writing is essential.

Closing date: 31 Oct., 1960.

Applications on Form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by the date stated, quoting the appropriate vacancy number. (S 293)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

ASSISTANT ENGINEER
(DIVISIONAL HEADQUARTERS)
FOURTH ASSISTANT ENGINEER

REQUIRED in the Electrical Department at Divisional Headquarters.

N.J.B. Agreement conditions. Superannuable appointment salary within Schedule B, Class BX, either Grade 9, 10 or 11, according to qualifications and experience. The salary ranges are as follows:—

Grade 9—£1,005/£1,325 per annum.
Grade 10— £935/£1,245 per annum.
Grade 11— £855/£1,165 per annum.

Candidates should possess a Higher National Certificate in Electrical Engineering or an equivalent qualification and should have had some experience on equipment associated with E.H.V. transmission. Previous applicants for this position will be re-considered and need not re-apply.

Apply, quoting vacancy number 271/60MD on form AE6 available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, to reach him not later than 24 Oct., 1960. (S 273)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

WESTERN NIGERIA DEVELOPMENT CORPORATION
IBADAN, NIGERIA

VACANCY FOR THE POST OF ELECTRICAL ENGINEER

THE Western Nigeria Development Corporation, Ibadan, Nigeria, invites applications from suitably qualified candidates to fill the vacant post of Electrical Engineer in its establishment.

Salary Scale:

£1,265 x £63—£1,517. Plus inducement allowance of £270 per annum. The point of entry will depend on qualifications and experience.

Qualifications:

Candidates should be Graduates of the Institution of Electrical Engineers or possess the Higher National Certificate in Electrical Engineering and preferably should have had a recognised apprenticeship including sound practical experience in factory installations. He must possess the ability to train Artisans in his field of work.

Duties:

The Officer appointed will be responsible to the Constructional Engineer for installation of electrical plant in a medium size factory in Nigeria and later under the Mill Manager, for maintenance of Electrical equipment including 415 V alternators rated up to 400 KW, M.T. switchgear and distribution, motors, lighting, etc.

Conditions of Service:

The terms of service include partly furnished accommodation at the rate of 8½% of the basic salary; free medical service. (In the case of an overseas officer being appointed, an outfit allowance for candidates coming to the tropics for the first time is payable, and a free passage for wife and free passages once each way per tour for children up to three in number not over the age of 13 are provided.) Employee is required to contribute 10% of salary to a Provident Fund; the Corporation contributes an equal amount. Leave at full pay is granted at the rate of five days for every completed month of service. Normal length of tour is 18/24 months.

Methods of Application:

Applications should be completed in triplicate on the prescribed form obtainable from the Official Secretary (Recruitment Branch), Office of the Commissioner for Western Nigeria, 178/202 Great Portland St, London W.1, from whom further particulars may also be obtained.

Closing date: November 7th, 1960

(S 213)

SOUTH EASTERN ELECTRICITY BOARD

DISTRICT COMMERCIAL ENGINEER
WEALD DISTRICT

SALARY under N.J.B. Class E, Grade 3 (Scale 11), £1,275/£1,410 per annum with progression to Grade 2 (maximum salary £1,500) subject to satisfactory service. Successful applicant will be required to organise and control all commercial activities in a predominantly rural district. Applicants should have had considerable experience in commercial, domestic and rural development of electricity supply including control of contracting section, showrooms and retail sales and all aspects of service to consumers. Corporate membership of the Institution of Electrical Engineers or equivalent qualification in electrical engineering will be an advantage.

Applications quoting ET and naming two referees to District Manager, Seeboard,

continued in next column

continued from previous column

Highgate, Hawkhurst, Kent, by 24 Oct., 1960.

SENIOR SALES REPRESENTATIVE
DORKING AND EPSOM DISTRICT

Salary: £700 x £25—£775 per annum under N.J.C. Grade 2. Superannuable.

The person appointed will be required to give advice on supply matters, tariffs and appliance sales and installations for domestic and small commercial consumers. Applicants must be thoroughly conversant with all types of domestic electrical appliances and in addition to acting as an outside representative must be prepared to carry out general showroom duties in any showroom within the Dorking and Epsom District.

Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 56 South St, Dorking, by 24 Oct., 1960.

DISTRICT COMMERCIAL ASSISTANT
EASTBOURNE DISTRICT

Salary: £700 x £25—£755 per annum under N.J.C. Grade 2. Superannuable.

Applicants should have experience in dealing with consumers' inquiries and be able to advise on supply matters, tariffs, appliances and domestic, agricultural and commercial installations. A thorough knowledge of electrical appliances and the ability to quote for small contracting work is necessary.

Applications quoting ET and naming two referees to District Manager, Seeboard, Electric Hse, Grove Rd, Eastbourne, by 24 Oct., 1960.

DISTRICT COMMERCIAL ENGINEER
DORKING AND EPSOM DISTRICT

Salary scale N.J.B. Class F, Grade 3, £1,350/£1,500 per annum with progression to Grade 2 (maximum salary £1,610) subject to satisfactory service.

Applications are invited for the above superannuable post, which offers wide scope for experience and advancement in a growing and pleasant urban and rural district in Surrey, supplying over 40,000 consumers. Applicants should be conversant with tariff negotiations, sales activities, contracting and general load development, and should preferably be corporate members of the I.E.E. Consideration will be given to a private car allowance and assistance for house purchase in appropriate circumstances.

Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 56 South St, Dorking, by 24 Oct., 1960.

JOINTER E.H.T.
THANET DISTRICT

Wages: 5s 6¾d per hour for 42-hour, five-day week under N.J.I.C. Agreement.

Applications quoting ET and naming two referees to District Manager, Seeboard, Electricity Offices, St. Peter's, Broadstairs, Kent, by 21 Oct., 1960.

GEORGE WRAY,
Secretary.
(S 292)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 3 Sub-Area

APPOINTMENT OF COMMERCIAL OFFICER

APPLICATIONS are invited for the above appointment, based on Chester, at a salary within the range £2,170/£2,380. N.J.M. Grade 5, Class C (Scale 3).

The duties of the appointment include the direction and supervision of commercial activities in the Board's No. 3 Sub-Area, involving the negotiation of rural and industrial supply schemes, control of service centres and sales of appliances, consumers' service and contracting.

Candidates should possess suitable technical qualifications.

Appointment subject to medical examination. Pension Scheme.

Applications should be made to the Manager, No. 3 Sub-Area, Electricity Hse, Newgate St, Chester.

Closing date: 24 Oct., 1960. (S 262)

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment:

STATION SHIFT CONTROL ENGINEER
BEDFORD GENERATING STATION
(S.V. No. 1381)

Salary N.J.B., Class D, Grade 10, Scale 3, £715/£805 per annum, plus £90 Shift Allowance.

Applicants should have reached the standard of Ordinary National Certificate in Electrical Engineering, or its equivalent, have experience in the operation of a switchboard at a generating station and be fully conversant with the high-voltage switching operations and protective systems.

Applications, quoting reference S.V. No. 1381, stating age, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 22 Oct., 1960. (S 265)

NORTH EASTERN GAS BOARD

Head Office

ELECTRICAL ENGINEER

APPLICATIONS are invited for the above position at a salary within Group D (£1,695/£1,895 per annum) of the National Salaries Tables for Senior Gas Officers.

Candidates must be Corporate Members of the Institution of Electrical Engineers with wide experience in the layout and installation of electrical equipment in works and factories. Experience of electrical practice in gasworks and gas distribution systems, including remote supervisory control installations will be an advantage.

The duties will include responsibility for the design of medium voltage distribution systems and for specifications of electrical equipment, for supervising contractors' installation work and for advising on maintenance work of electrical equipment.

Applicants should complete the official application form which may be obtained from, and must be returned to, The Chief Engineer, North Eastern Gas Board, Bridge St, Leeds 2, not later than 26 Oct., 1960.

J. C. GARDNER,
Secretary.

Bridge St,
Leeds 2. (S 272)

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule "B". Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

FOURTH ASSISTANT ENGINEER
MEASUREMENTS SECTION
ELECTRICAL DEPARTMENT
CHURCHFIELDS ROAD
BECKENHAM, KENT
Vacancy No. 60/831.

Candidates should have experience of the repair, calibrating and testing of polyphase meters and indicating instruments, together with some knowledge of electronic techniques as applied to metering and measurements work. Applicants should have the Higher National Certificate in Electrical Engineering or its equivalent, but consideration will be given to those holding the Ordinary National Certificate, providing they have adequate experience of the work outlined above, and are continuing their studies.

Salary: Class BX, Grade 11, £905/£1,215 per annum from 1.7.60, £950/£1,215 per annum from 1.7.61.

Applications, quoting vacancy No. to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London W.1, by 25 Oct., 1960. (S 271)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

THE NORTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER
BURY DISTRICT

THE duties will include assisting the District Engineer in the construction, operation and maintenance of the 33 kV, 11 kV and low voltage distribution systems.

The possession of the H.N.C. and Graduate Membership of the Institution of Electrical Engineers would be an advantage.

Salary scale: £1,040/£1,165 p.a. Grade H.9. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton, and returned to him by 25 Oct., 1960.

FOURTH ASSISTANT ENGINEER (METERS)
CARLISLE TESTING STATION
SUB-AREA ENGINEERING DEPARTMENT

Applicants should have had experience in a Class "A" Polyphase Meter Testing Station. They should be familiar with the methods adopted for determining instrument current and voltage transformer errors and the application of these to Meter calibration. A knowledge of summation metering methods is desirable and it would be an advantage to have some knowledge of Protection Relays. Experience in the use of standardising equipment is essential.

Preference will be given to candidates who hold the H.N.C. in Electrical Engineering.

Salary scale: £890 x £25—£1,015 p.a., Grade K.13. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, and returned to him by 25 Oct., 1960. (S 268)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Central Gloucestershire Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER
(DEAN FOREST)

Experience necessary in all branches of distribution work including construction, maintenance and operation of high- and low-voltage underground and overhead systems and substations. Technical qualifications desirable. Salary £965/£1,090 per annum (N.J.B. Grade E.7). Apply, by letter, within 14 days, stating age, experience, present position and salary, to Mr S. Raybould, Sub-Area Manager, Midlands Electricity Board, Eastern Ave, Gloucester.

WAYLEAVE OFFICER
(SEVERN VALE)

Duties include surveying and plotting of routes and assisting in the negotiation and preparation of Wayleave Agreements, etc. Salary £700/£775 per annum, N.J.C. Grade 2. Apply, by letter, within 14 days, stating age, present employment and details of experience, to District Manager, Midlands Electricity Board, Bowling Hill, Chipping Sodbury, Bristol.

F. W. CATER,
Secretary.
(S 264)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER (PLANNING)
(Z.1262)

READING District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class J, Grade 10 (£1,040/£1,165 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks, and to undertake standby duties if required. Applicants should possess suitable technical qualifications.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)
(Z.1253)

Newbury District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class F, Grade 9 (£890/£1,015 per annum). N.J.B. Conditions or Service.

The duties of the post will be to assist with the maintenance and operation of H.V.

continued in next column

continued from previous column

and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications for these appointments on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting the appropriate "Z" number, not later than 24 Oct., 1960.

WAYLEAVE OFFICER

Sub-Area Engineer's Department of No. 1 (Southall) Sub-Area, located at Waterloo Rd, Uxbridge, Middlesex. Salary: N.J.C. Grade 2 (£700/£775 per annum, plus London Weighting). N.J.C. Conditions of Service.

The duties of the post will include the ability to negotiate Wayleave Agreements for the erection or laying of electric lines and installation of substations and plant.

Applications on forms obtainable from the Sub-Area Secretary, 2/6 Windmill La, Southall, Middlesex, and returned to him, quoting Z.1260, not later than 24 Oct., 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. (S 295)

LONDON ELECTRICITY BOARD

DISTRICT MANAGERS

APPLICATIONS are invited from suitably qualified persons for two appointments of District Manager, the present vacancies being in the North Western and South Eastern Districts.

The salary will in each case be in accordance with Class D, Grade 7, of the National Joint Managerial and Higher Executive Grades Agreement (£2,875/£3,100 per annum, including London Allowance).

Applications, stating age, qualifications, experience, present position and salary, should reach the Chairman of the Board at 46 New Broad St, E.C.2, by 28 Oct., 1960.

S. MORTON GORE,
Secretary.
10 Oct., 1960. (S 289)

SOUTH GEORGIA

ASSISTANT DIESEL ELECTRIC MECHANIC

REQUIRED by Falkland Islands Government for service in South Georgia for one tour of 2-2½ years in first instance. Salary according to experience and ability in scale rising to £540 a year. Gratuity at rate of £10 for each completed month of residential service. The officer will be provided with free furnished accommodation and with free fuel and lighting. Meals will also be free. Free passages. Liberal leave on full salary.

Candidates, single and under 40 years of age, must be able to repair and maintain diesel electric (A.C.) generators up to 75 kW and service electrical equipment.

Apply to Crown Agents, 4 Millbank, London, S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/51163/EE. (S 277)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

LITTLEBROOK POWER STATION
Vacancy No. 202/60/T.
GENERAL ASSISTANT ENGINEERS
(CONTROL)

REQUIRED to generally assist Control Engineers. The successful applicants will be expected to carry out shift duties in the Control Room. Education to O.N.C. standard would be preferable. Salary: N.J.B. Class L, Grade 19—£755/£835 per annum, including London Allowance and shift allowance.

Applications, giving age and all relevant details and quoting vacancy number, should be sent to the Station Superintendent, Littlebrook Power Station, nr. Dartford, Kent, to arrive by 21 Oct., 1960.

W. H. DUNKLEY,
Divisional Controller.
(S 278)

CITY COUNCIL OF NAIROBI

ELECTRICAL ENGINEER

APPLICATIONS are invited for the above post in the salary scale £1,605 x £50—£2,005 per annum.

Applicants must have considerable experience in:

(i) preparation of specifications and design work for installations in public buildings, housing schemes and pumping plant for water and sewerage schemes;

(ii) design for street lighting installations and organisation of street lighting maintenance section.

A.M.I.E.E. preferred.

The appointment is on contract—gratuity terms for a tour of four years, followed by 78 working days' leave. Gratuity of 10% of total overall salary received will be paid on completion of tour.

Free return passages up to three adults.

Summary of main terms of service and application forms are available from the East African Office, Grand Bldgs, Trafalgar Sq, London W.C.2. Applications should reach the Establishment Officer, P.O. Box 30037, Nairobi, by 19 Nov., 1960.

ROBERT LUNN,
Town Clerk.
City Hall,
Nairobi.
5 Oct., 1960. (S 263)

THE SOUTH WALES ELECTRICITY BOARD

COMMERCIAL ASSISTANT
ASSISTANT ENGINEERS

APPLICATIONS are invited for the following superannuable positions in the Cardiff and East Central and Swansea and West Central Areas of the Board:

(a) COMMERCIAL ASSISTANT
PONTYPRIDD DISTRICT

(b) ASSISTANT ENGINEER
PONTYPRIDD DISTRICT

The duties of these posts will be of a general nature and preference will be given to Engineers possessing a Higher National Certificate in Electrical Engineering.

Salary: (a) and (b) N.J.B. Class F, Grade 9, Scale 6 (£890/£1,015 per annum).

Applications stating age, present position, present salary, qualifications and experience should be addressed to C. L. Townsend, ASSOCIATE I.E.E., Manager, Cardiff, and East Central Area, 445/447 Cowbridge Rd East, Cardiff, to arrive not later than 29 Oct., 1960.

Please quote reference 83/60(a)/ET or 83/60(b)/ET endorsing envelope with appropriate designation of post.

(c) GENERAL ASSISTANT ENGINEER
SWANSEA DISTRICT

The duties of this post will be of a general nature and preference will be given to Engineers possessing a Higher National Certificate in Electrical Engineering.

Salary: N.J.B. Class G, Grade 9, Scale 7 (£965/£1,090 per annum).

Applications stating age, present position, present salary, qualifications and experience, should be addressed to G. R. T. Edwards, B.SC., M.I.E.E., M.AM.I.E.E., Manager, Swansea and West Central Area, 29 Ystrad Rd, Swansea Industrial Estate, Swansea, Glam, to arrive not later than 29 Oct., 1960.

Please quote reference 190/60/ET endorsing envelope "General Assistant Engineer."

R. G. WILLIAMS,
Secretary.
(S 275)

MIDDLESEX COUNTY COUNCIL

Education Dept.

SENIOR LABORATORY STEWARD

REQUIRED at Hendon Technical College, The Burroughs, Hendon, N.W.4, for Electrical Engineering and Physics Laboratories. Duties will include supervision of Stewards' work. Must have good industrial experience and be skilled in instrument repair and maintenance. Salary: Miscellaneous VI, £760/£825 p.a., plus London Weighting up to £40. Prescribed conditions. Application forms from Principal, above address returnable by 28 Oct. (Quote E.534 ET). (S 276)

GOVERNMENT OF SIERRA LEONE

COMMERCIAL ENGINEER (ELECTRICAL)
ELECTRICITY DEPARTMENT

RESPONSIBLE for implementation of tariffs, negotiations and preparation of special agreements, sales control of stores, policy, investigation and preparation of cost analysis, etc.

Contract appointment for three tours of 18/24 months. Salary range £2,300/£2,450 with gratuity. Outfit allowance. Children's allowance. Free passages. Rented quarters.

Candidates 30-45 years must be A.M.I.E.E. with experience in budgeting, control of revenue and expenditure and forecasting of expenditure and capital requirements. Write to Director of Recruitment, Colonial Office, London S.W.1, giving full names, age, qualifications and experience, quoting BCD. 145/15/08/D10. (D 267)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

Tyne Sub-Area

SENIOR ASSISTANT ENGINEER
SUB-AREA COMMERCIAL OFFICER'S STAFF
SUB-AREA HEADQUARTERS, NEWCASTLE

Applicants should have a wide experience of commercial practice and distribution in electricity supply, including development work in urban and rural areas.

Salary: Schedule A, Class I., Grade 4, £1,795/£1,950, N.J.B. conditions.

Wear Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER
CROOK DISTRICT

Salary: Schedule A, Class E, Grade 7, £965/£1,090. N.J.B. conditions.

THIRD ASSISTANT DISTRICT ENGINEER
DURHAM DISTRICT

Salary: Schedule A, Glass G, Grade 9, £965/£1,090. N.J.B. conditions.

Applicants for the above two vacancies must have had sound practical training and experience in construction, operation and maintenance of H.V., M.V. and L.V., overhead and underground distribution networks, substation plant and auxiliary equipment. Preference will be given to candidates with qualifications leading to Corporate Membership of I.E.E.

DEMONSTRATORS
AT DURHAM AND CHESTER-LE-STREET RESPECTIVELY

Applicants should have a certificate of a recognised Domestic Science Training College and/or E.A.W. Certificate, preferably the latter; also experience as a demonstrator or assistant demonstrator in the Electricity Supply Industry.

Salary: Grade 1, £600/£700. N.J.C. conditions.

Applications, stating age, qualifications and experience, to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne 1, within ten days of the appearance of this advertisement. (S 294)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

RESIDENT ENGINEER
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 231/60

A VACANCY exists for a Resident Engineer to supervise the Headquarters' works of the Central Electricity Generating Board in the East Midlands Division. The successful applicant will be located at Nottingham and will be responsible to the Chief Transmission Project Engineer at Headquarters for the supervision of contractors in the construction of 275 kV and 132 kV substations and the installation of high voltage cables.

Applicants should have a wide experience of 275 kV and 132 kV switchgear and transformers and be thoroughly conversant with modern control and protection arrangements and be capable of dealing with contractors' diagrams.

Applicants should possess an Electrical Engineering Degree or Higher National Certificate or other suitable qualifications.

The salary will be in accordance with Grade BX 5, Scale 14 (£1,535/£1,720 per annum) of the National Joint Board Agreement, and the position will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be addressed to O. S. Woods, Esq., Divisional Controller, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, to arrive not later than 18 Nov., 1960.

O. S. WOODS,
Divisional Controller.
(S 287)

CENTRAL ELECTRICITY BOARD OF THE FEDERATION OF MALAYA

APPLICATIONS are invited from suitably qualified Federal Citizens of the Federation of Malaya for the posts of ELECTRICAL ENGINEERS (Division I).
Monthly Salary Scales:

Time Scale "B"

between $740 and $950 for a single man:
between $870 and $1,140 for a married man;
between $870 and $1,195 for a married man with family.

Time Scale "A"

between $1,000 and $1,254 for a single man;
between $1,190 and $1,430 for a married man;
between $1,265 and $1,505 for a married man with family.

Candidates, who must be at least 24 and below 40 years of age, must have had a good general education and be Corporate Members or Graduates of the Institution of Electrical Engineers or possess degrees or other educational qualifications carrying exemption from the Institution Graduateship Examinations. They should have had sound training in both Electrical and Mechanical Engineering and experience in the operation of Electricity Supply Undertakings. They should possess a competent knowledge of the erection and maintenance of high and low tension overhead and underground A.C. Distribution Systems and substation plant. Experience in the operation and maintenance of diesel engines an advantage.

Apply to Crown Agents, 4 Millbank, London S.W.1, for application form and further particulars, stating age, name and brief details of qualification and experience and quoting reference M2A/50326/EE. (S 270)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

MAINTENANCE ENGINEER (ELECTRICAL)

REQUIRED at Stourport Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K5, £1,535/£1,720 per annum.

A sound technical training and practical experience in the maintenance of modern power station electrical plant is required, and the possession of appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 269/60MD on Form AE6, available from the Station Superintendent, Stourport Power Station, Severn Side, Stourport-on-Severn, Worcs, by 24 Oct., 1960. (S 274)

THE EAST MIDLANDS ELECTRICITY BOARD

Ilkeston & North Derbyshire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER
MATLOCK DISTRICT
Vacancy No. 112/60.

SALARY: N.J.B. Class F, Grade 8, £965/£1,090 per annum.

The duties include responsibility for the operation and maintenance of overhead and underground systems and substations up to and including 33 kV.

Ability to drive a car is necessary and the successful applicant will be required to reside in the District and to undertake standby duty.

Applications giving details of age, qualifications, previous experience, present position and salary, should be addressed to The Manager, Matlock District, The East Midlands Electricity Board, "Glendon," Knowleston Pl, Matlock, Derbyshire, within 14 days of the date of this advertisement.

Northamptonshire Sub-Area

FOURTH ASSISTANT ENGINEER
Vacancy No. 113/60.

Salary: N.J.B. Class K, Grade 12, £965/£1,090 per annum.

Duties include assisting in H.V. system commissioning tests, protective equipment tests and fault locating.

Ability to drive a car is essential and the successful candidate will be required to reside in or near Northampton.

Applications giving details of age, qualifications, previous experience, present position and salary, should be addressed to The Manager, Northamptonshire Sub-Area, The East Midlands Electricity Board, 25 Bridge St, Northampton, within 14 days of the date of this advertisement. (S 290)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

RESIDENT ENGINEER (CIVIL WORKS)
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 238/60

A VACANCY exists for a Resident Engineer to supervise the Headquarters' works of the Central Electricity Generating Board in the East Midlands Division. The successful applicant will be located at Nottingham and will be responsible to the Chief Transmission Project Engineer at Headquarters for the supervision of contractors in the construction of civil works associated with 275 kV and 132 kV substations.

Applicants should have a wide experience of civil and building works, including reinforced concrete structures.

Applicants should be Corporate Members of the Institution of Civil Engineers.

The salary will be in accordance with Grade BX 5, Scale 14 (£1,535/£1,720 per annum) of the National Joint Board Agreement, and the position will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be addressed to O. S. Woods, Esq., Divisional Controller, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, to arrive not later than 25 Nov., 1960.

O. S. WOODS,
Divisional Controller.
(S 286)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

ASSISTANT SHIFT CHARGE ENGINEERS
WILLINGTON "B" POWER STATION
Vacancy No. 230/60.

APPLICATIONS are invited for the positions of Assistant Shift Charge Engineers at Willington "B" Power Station, P.O. Box No. 27, Derby.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate or its equivalent.

Salary will be in accordance with Class K, Grade 8 (£1,275/£1,410 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Applicants for Vacancy No. 153/60 need not re-apply.

Closing date for receipt of applications: 22 Oct., 1960.

ASSISTANT SHIFT CHARGE ENGINEER
LEICESTER POWER STATION
Vacancy No. 232/60.

Applications are invited for the position of Assistant Shift Charge Engineer at Leicester Power Station, Rawdykes Rd, Leicester.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate or its equivalent.

Salary will be in accordance with Class G, Grade 9 (£965/£1,090 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 29 Oct., 1960.

ASSISTANT MAINTENANCE ENGINEER
(MECHANICAL)
LEICESTER POWER STATION
Vacancy No. 233/60.

Applications are invited for the position of Assistant Maintenance Engineer (Mechanical) at Leicester Power Station, Rawdykes Rd, Leicester.

Applicants should have served a recognised apprenticeship in mechanical engineering. Preference will be given to candidates who possess technical qualifications to Higher National Standard.

Salary will be in accordance with Class G, Grade 8 (£1,040/£1,165 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 29 Oct., 1960.

ASSISTANT MAINTENANCE ENGINEER
(ELECTRICAL)
NORTHAMPTON POWER STATION
Vacancy No. 236/60.

Applications are invited for the position of Assistant Maintenance Engineer (Electrical) at Northampton Power Station, Nunn Mills Rd, Northampton.

Applicants should have received a thorough technical and practical training, with good experience in maintenance of alternators, transformers, switchgear, and associated electrical equipment. Preference will be given to holders of the Higher National Certificate in Electrical Engineering

Salary will be in accordance with Class G, Grade 8 (£1,040/£1,165 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 22 Oct., 1960.

STATION SHIFT CONTROL ENGINEER
WARWICK POWER STATION
Vacancy No. 237/60.

Applications are invited for the position of Station Shift Control Engineer at Warwick Power Station, Emscote Rd, Warwick.

Candidates should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class E, Grade 10 (£765/£870 per annum) of the National Joint Board Agreement, plus £90 per annum allowance for shift duties.

Closing date for receipt of applications: 29 Oct., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

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Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned and should be returned to the Station by the date stated.

O. S. WOODS,
Divisional Controller.
(S 288)

YORKSHIRE ELECTRICITY BOARD

No. 1 (Bradford) Sub-Area

SKIPTON DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER

APPLICANTS should have passed the Associate Membership Examination of the Institution of Electrical Engineers or hold equivalent qualifications, and have experience in construction, operation and maintenance of high-voltage systems, underground cables, overhead lines and substations and medium low-voltage networks.

Candidates should be prepared to reside within the District and undertake standby duties.

Salary: N.J.B. Class E, Grade 9 (Scale 5), £825/£940 per annum.

Applications, together with the names of two referees, should be returned to the Manager, Yorkshire Electricity Board, No. 1 (Bradford) Sub-Area, 45-53 Sunbridge Rd, Bradford, not later than 28 Oct., 1960.

No. 4 (Leeds) Sub-Area

SENIOR SALES REPRESENTATIVE
(COMMERCIAL CATERING)

Applicants should have had previous sales experience preferably within the Electrical Supply Industry and be competent to give advice in connection with the planning and installation of electrical equipment used by the commercial catering and bakery trades.

Preference will be given to applicants who have served an electrical apprenticeship or who are in possession of the Diploma or Sales Certificate of the Electrical Development Association.

Salary: N.J.C. Grade 2, £700 x £25—£775 per annum.

Applications, together with the names of two referees, should be returned to the Manager, Yorkshire Electricity Board, No. 4 (Leeds) Sub-Area, Bramhope, nr. Leeds, not later than 28 Oct., 1960.

No. 7 (Grimsby) Sub-Area

GRIMSBY DISTRICT
SENIOR SALES REPRESENTATIVE
(AGRICULTURAL DEVELOPMENT)

Applicants should be experienced in the application of electricity for agricultural purposes and rural development, and must be capable of advising on supply matters, tariffs, apparatus and sales to consumers with domestic or small commercial or industrial installations.

Salary: N.J.C. Grade 2, £700 x £25—£775 per annum.

Applications, together with the names of two referees, should be returned to the Manager, Yorkshire Electricity Board, No. 7 (Grimsby) Sub-Area, Moss Rd, Grimsby, not later than 28 Oct., 1960. (S 291)

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointments in the System Operation Department, Thames North Grid Control, Redbourn, nr. St. Albans, Herts.

THIRD ASSISTANT ENGINEER
(S.V. No. 1397)

Salary: N.J.B., Class BX, Grade 8, Scale 11, £1,105/£1,410 per annum plus 10% Shift Allowance.

Applicants should preferably be qualified up to Graduate Membership standard of the I.E.E. and some Generating Station and/or transmission/technical experience is essential.

The successful applicant will be required to undertake shift duties in the Grid Control Room.

FOURTH ASSISTANT ENGINEERS
(S.V. No. 1398)

Salary: N.J.B., Class BX, Grade 9/11, within the range of Scales 8/10, £855/£1,325 per annum.

The commencing salaries will be within the above range at a point commensurate with qualifications and experiences.

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Candidates must be qualified at least to Higher National Certificate standard and some generating station or transmission/technical experience is desirable. The duties are on day work and are of a general technical and statistical nature, but applicants should be prepared ultimately to undertake shift duties in the Grid Control Room.

Applications, quoting the appropriate reference Staff Vacancy No., stating age, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts., to arrive not later than 22 Oct., 1960. (S 269)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments in the South Wales Division.

STATION SHIFT CONTROL ENGINEER
TIR JOHN POWER STATION
Vacancy No. 262/ET/60.

Salary: Schedule A, Class H, Grade 10, Scale 7, £965/£1,090 per annum, plus 10% shift enhancement.

Applicants should possess H.N.C., or equivalent qualifications and have operating experience in a modern Power Station.

Opportunities will be given for further operational experience.

THIRD ASSISTANT ENGINEER
CONSTRUCTION SECTION
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 263/ET/60.

Salary: Schedule B, Class AX, Grade 8, Scale 10, £1,105/£1,325 per annum.

Duties will include the preparation and examination of tenders and the preparation of recommendations for the letting of contracts, correspondence with Contractors and site supervision of the installation of all types of plant associated with the construction of 132 kV Substations and overhead lines.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 28 Oct., 1960. (S 320)

LONDON ELECTRICITY BOARD

DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Board's Essex Suburban District at 497/9 Ley St, Ilford.

Candidates should have experience on mains recording work, be able to obtain details on site and compile neat and accurate permanent records.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 1, i.e., £600/£700 per annum, plus the appropriate London Area Allowance.

Applications giving details of age and experience should be sent to the Administrative Officer at the above address within 14 days of the publication date of this notice. Please quote ref.: PER/V/3086/T. (S 285)

LEEDS COLLEGE OF TECHNOLOGY

Calverley Street, Leeds 1

PRINCIPAL: C. CHEW, M.SC.(TECH.), F.R.I.C.

APPLICATIONS are invited for the following posts:

SENIOR LECTURER IN ELECTRICAL ENGINEERING

Applicants should have a good degree in the subject with industrial or research experience in electronics and telecommunications. Burnham Technical Scale: £1,550 x £50—£1,750 a year.

LECTURER IN ELECTRICAL ENGINEERING

Applicants should have a good degree in the subject and preferably have experience on the light current side. Burnham Technical Scale: £1,370 x £35—£1,550 a year.

Further particulars and form of application, to be returned by 28 Oct., 1960, may be obtained by sending a stamped addressed envelope to the Principal of the College.

GEORGE TAYLOR,
Chief Education Officer.
(S 266)

UNITED KINGDOM ATOMIC ENERGY AUTHORITY

Vacancies at

A.E.R.E. HARWELL

for

Electronic Mechanics

(training would be given to men with a good skilled electrical background who have some knowledge of and aptitude for electronics and wish to further their experience in this work.)

Electricians and Electrical Fitters

(Several of these vacancies are for men with experience in installation on maintenance of heavy industrial or power station electrical plant or control systems.)

Electro/Mechanical Instrument Mechanics

(to operate and maintain a wide range of recording instruments in reactors and other installations.)

Several of these vacancies are with the new establishment being set up at Harwell for the National Institute for Research in Nuclear Science and for another new establishment being built nearby at Culham to take over the thermonuclear programme of work at present being carried out at Harwell.

Interesting and varied work where there are excellent opportunities for advancement. Assistance is given towards further education.

The Authority has sick leave and superannuation schemes and is at present operating a local assisted transport scheme.

Housing

Married men living outside the Harwell transport area will be housed or given assistance with house purchase.

Please send for explanatory booklet and application forms to: Industrial Recruitment Office, A.E.R.E., Harwell, Didcot, Berkshire.

(S 303)

South Western ELECTRICITY

SOUTH WESTERN ELECTRICITY BOARD

Applications are invited for the following position:

FOURTH ASSISTANT ENGINEER
CENTRAL CONSTRUCTION DEPARTMENT, TAUNTON

Salary within Class AX, Grade 11, Salary Scale 7, £855/£1,090 per annum, of the N.J.B. Agreement.

Candidates should have had experience in the organisation and supervision of erection gangs engaged on the construction of low voltage, light rural and heavy wood pole lines up to 0·15 sq in., 33 kV, and be capable of assisting in the construction of substations and the laying of underground mains.

Applications to be made on standard form AE6/ACT obtainable by postcard only from the Establishments Officer, South Western Electricity Board, Electricity Hse, Colston Ave, Bristol 1. Closing date for receipt of completed applications is Saturday, 29 Oct., 1960.

(S 299)

ASSISTANT ELECTRICAL ENGINEER required by National Newspaper. Age 23-28. Electrical apprenticeship and Higher National. Must be first class electrical draughtsman. Good prospects. Box No. 8041, Electrical Times. (S 316)

BP requires an ELECTRICAL ENGINEER for service with its Exploration Department Overseas. Applicants aged between 25 and 30 must possess H.N.C. and preferably be Graduate Members of the I.E.E. Applicants should have experience in the installation and subsequent maintenance of Electrical Equipment, associated with diesel engine driven generating plant; 3·3 kV and 440 V Overhead and Underground distribution systems; domestic, industrial and flameproof equipment. Salaries according to qualifications and experience. Short leave to the U.K. every four months. Generous kit and other allowances. Free Medical attention. Write, giving full particulars, quoting F.592A to Box 3309, c/o Hanway Hse, Clark's Pl, E.C.2. (S 304)

BRITTSH ENGINE BOILER & ELECTRICAL INSURANCE CO. LTD., 98 West George St, Glasgow C.2. ELECTRICAL SURVEYOR required in Scotland. Permanent position carrying progressive salary scale, £800/£1,100, and non-contributory pension. Candidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply, stating age, qualifications and experience. (S 306)

ELECTRICAL ENGINEER with knowledge of control gear application required as sales representative for a well-known but small manufacturing company in Middlesex. Those interested are requested to forward personal data, giving particulars of technical training and expected renumeration. The Company concerned operates Pension and Efficiency Bonus Schemes. Reply to Box No. 8043, Electrical Times, marking envelope "Staff." (S 317)

CONTRACT and ASSISTANT ENGINEERS required by London Contractor. Experience of estimating, control of labour, cabling and industrial installation schemes. Permanent and progressive positions offering good remuneration and fringe benefits full particulars of age and experience to Box No. 7993, Electrical Times. (S 23)

ELECTRICAL ENGINEER required for Glasgow Office staff, age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler and Electrical Insurance Co. Ltd., 98 West George St, Glasgow C.2. (S 305)

FULLY EXPERIENCED ELECTRICIAN required, preferably with knowledge of lift work. Position of responsibility with genuine prospects. Please write giving details of experience.—Box No. 8037, Electrical Times. (S 314)

UNILEVER LIMITED

require a

Technical Assistant (Electrical)

based on their London office to carry out interim inspection of electrical installations being executed by various contractors at many Associated Companies' premises in the U.K. and commission the installations in question on completion.

This would involve travelling several days per week and suitable out-of-town expenses and car travelling allowance would be paid.

Applicants should hold the H.N. Certificate in E.E. (preference given to an A.M.I.E.E. or Graduate I.E.E. with appropriate contracting experience).

Superannuation Scheme; five-day week; salary according to experience.

Applications should be addressed to:
Head Office Staff Department (Ref.WF/68),
UNILEVER LIMITED,
Unilever House, Blackfriars, E.C.4.

(S 283)

Electrical Draughtsmen

are required by

W. H. ALLEN SONS AND COMPANY LTD. for their Electrical Drawing Office

Applicants should either hold a National Certificate or be able to demonstrate previous experience of work associated with a.c. and d.c. motors and generators and/or control gear.

The Company offers excellent prospects, good conditions of service and a contributory pension and life assurance scheme. Where appropriate assistance will be given towards expenses involved in moving to the Bedford area.

Applications in writing, giving details of age, experience and qualifications and present salary to:

The Personnel Manager (Ref. 506/5)
Queens Engineering Works
BEDFORD

(S 301)

ELECTRICAL ENGINEER

Required, age 30-40, with experience of installation of machines and distribution systems for heavy industrial plant.

Applicant with degree preferred who should have had engineering training and/or a recognised apprenticeship and be capable of designing works electrical layouts and of negotiating contracts with manufacturers.

Salary in accordance with qualifications and experience. Profit Sharing Scheme, Pension Fund and usual facilities.

Apply, under confidential cover, with details of education and experience, to:—

The Manager,
CENTRAL ENGINEERING DEPARTMENT,
THE ASSOCIATED PORTLAND CEMENT MANUFACTURERS LTD.,
Portland House,
Tothill Street,
London, S.W.1. (S 284)

RESEARCH ENGINEER

If you are at least a graduate member of the Institution of Electrical Engineers, aged between 25 and 35 and would like to work in the world's largest glass research unit, you are invited to write about yourself to the Personnel Officer (Graduate Recruitment), Pilkington Brothers Ltd., St. Helens, Lancashire.

You would be responsbile for the design, purchase, installation, maintenance and safety of experimental pilot plant equipment of several hundred kV capacity. In addition, you would be expected to keep abreast of research work in similar fields and carry out basic experiments where necessary to establish required design data.

(S 297)

ELECTRICAL DRAUGHTSMAN to take charge of small drawing office in works situated North London manufacturing distribution switchboards and general installation equipment. As the appointment would involve some work on the board it would probably suit a younger man with several years' recent experience as Designer Draughtsman, and who is looking for some added responsibility and an outlet for originality and initiative. Commencing salary not less than £900 p.a. with senior staff and pension benefits.—Box No. 8029, Electrical Times. (S 259)

ENFIELD-STANDARD POWER CABLES LIMITED have the following vacancies in their Contracts Dept. A qualified ELECTRICAL ENGINEER to plan systems and layouts of Power and Control Cables associated with major industrial installations and to commission the circuits after installation. Also a SENIOR and a JUNIOR DRAUGHTSMAN for work in connection with the above. Write full details or apply to Contracts Manager, Stockingswater La, Brimsdown, Enfield, Middlesex. (S 309)

LARGE FIRM, Electrical Contractors, require FIRST CLASS SITE ENGINEER experienced in Steelwork Installation. Able to control large labour force and negotiate with Clients' Representatives. Attractive Salary. Write in confidence to Box No. 8039, Electrical Times. (S 315)

ELECTRICAL ENGINEERING TECHNICAL ASSISTANT

required in the London area by Southern Region, British Railways, for work connected with mechanical and electrical equipment of multiple unit electric trains.

Ability to investigate failures and write reports. Technical qualifications to Higher National Certificate desirable.

Salary range: £875/£948 per annum.

Application forms may be obtained from the Chief Mechanical and Electrical Engineer, Southern Region, British Railways, 15 St. Thomas St, London Bridge, S.E.1.

(S 298)

TRANSMISSION TEST ENGINEERS

Men with telecommunication experience are required at Greenwich for electrical testing on submarine cable systems and at Erith, Kent, for testing and inspection of unit assemblies during manufacture of underwater repeaters forming part of these systems. Precision equipment of advanced design is used. Technical qualifications up to H.N.C. standard are desirable, but men with previous practical experience of transmission measurement will also be acceptable. Starting salaries will be in accordance with qualifications and experience. Write with full details including present salary to Staff Officer, Submarine Cables Ltd., Christchurch Way, Greenwich, S.E.10.

(S 308)

ELECTRICAL ENGINEER

If you have a good honours degree in Electrical Engineering, are aged between 26 and 30, and would like to join the Commonwealth's largest glass manufacturing organisation, you are invited to write about yourself to the Personnel Officer (Graduate Recruitment), Pilkington Brothers Ltd., St. Helens, Lancashire.

You would take charge of the impulse section of one of the best equipped high voltage insulator laboratories in the country, utilising test voltages of up to 2,000 kV. An extensive programme of research and development relating to toughened glass power line insulators is in progress. You do not require to have had previous experience of this type of work, we will arrange appropriate training.

(S 296)

Monsanto Regd.

SENIOR ELECTRICAL DRAUGHTSMEN

required in the Engineering Department, London. Experience of power, lighting and control installation in the chemical or allied industries is essential. Applicants, preferably with H.N.C. and practical background in electrical engineering, should be able to work on own initiative.

Good salary and prospects in permanent post; non-contributory pension scheme.

Applications, giving details of age, qualifications and experience, should be sent to:

The Staff Relations Officer (DL 170),
MONSANTO CHEMICALS LIMITED,
10/18 Victoria Street,
LONDON S.W.1.

(S 302)

JUNIOR ELECTRICAL ENGINEER required as Assistant to the Chief Electrical Engineer of a large modern steel works in the Midlands. The appointment carries responsibility for technical development under the general guidance of the Chief Electrical Engineer and gives excellent opportunities for promotion. Candidates, preferably with experience in the heavy electrical field, should possess H.N.C. minimum or graduate standard qualifications.

Write, giving age, details of experience, qualifications and salary level expected to Box 8035, Electrical Times. (S 313)

QUALIFIED ELECTRICAL DESIGN ENGINEER required to work in Jamaica on power and lighting schemes for building projects. Work includes design and supervision. Some knowledge of other building services and air conditioning an advantage. Apply in writing giving full details of age, experience and U.K. salary required (successful candidate will work in London office initially) to: Norman and Dawbarn, Architects and Consulting Engineers, 7 Portland Pl, London W.1. (S 253)

SENIOR ELECTRICAL DESIGNER DRAUGHTSMAN required by internationally known U.S. engineering firm for position at Ruislip, Middlesex. Must have five years' recent experience in design of office buildings, factories, power plants communications centres, etc. High salary. Please 'phone Mr Thomas, VIKing 1740. (S 318)

SENIOR ELECTRICAL DESIGN ENGINEER required to lead team of approximately six assistant engineers and draughtsmen. Candidates to be thoroughly experienced in all aspects of electrical services work to buildings and to be suitably qualified. Salary offered will be not less than £1,500 per annum. Apply in writing giving full details of age, experience and salary required to Norman and Dawbarn, Architects and Consulting Engineers, 7 Portland Pl, London W.1. (S 254)

TECHNICIAN required to take charge of Cable Works Laboratory. Work involves chemical and physical testing of raw materials as well as components of Paper, Rubber or Plastic Cables. This position should appeal to a young man who wishes to supplement theoretical training with practical experience; knowledge of cable manufacture is desirable but not essential if other qualifications are good. Pension Scheme and canteen facilities. Apply to the Secretary, Britannic Cables Ltd., Iver, Bucks. (S 307)

BRITISH RAILWAYS

ELECTRICAL FITTERS

required

For maintenance of electrical equipment on the Distribution Section of the Eastern Region Electric Traction system in the London Area. Applicants must have served a recognised apprenticeship. Experience with H.V. switchgear and/or control system an advantage. Shift working is involved. Rate of pay is the equivalent of £11 0s 9d per standard week of 44 hours, plus appropriate shift allowance which averages 33s per week, and enhanced pay for overtime and Sunday duty. Certain free and reduced rate rail travel facilities. Pension and Sick Pay Schemes. Prospects of promotion. Applicants will be required to undergo medical examination. Apply in writing giving details of age, experience, etc., to the

Electric Traction Engineer,
(London Area)
British Railways, Eastern Region,
off Ley Street,
Ilford, Essex.

(S 229)

W. H. ALLEN SONS & COMPANY LTD.
BEDFORD

require

AN ASSISTANT ELECTRICAL DESIGNER

(Ref 506/7)

Applications are invited for the post of an Assistant Electrical Designer to work on small to medium size A.C. machines.

The successful candidate will be between 21-30 years old and have either

(a) An H.N.C. in Electrical Engineering and previous experience in this type of work, or

(b) A degree in Electrical Engineering but whose experience in this field is limited.

In either case appropriate Membership of the Institution of Electrical Engineers is desirable.

EXPERIENCED MECHANICAL DRAUGHTSMEN

(Ref 404/7)

Applications are invited from experienced Mechanical Draughtsmen for positions in the Turbine and the Diesel Departments. Previous experience in these particular fields is not essential provided general mechanical experience has been obtained.

The Company offers excellent prospects to the right men, good conditions of service and operates a contributory Pension and Life Assurance Scheme. Where appropriate, assistance will be given towards the expense involved in settling in the Bedford area.

Application forms can be obtained by writing (quoting the appropriate reference) to:
THE PERSONNEL MANAGER, QUEENS ENGINEERING WORKS, BEDFORD (S 219)

VACANCIES exist for Technical Sales Engineers and Testers with experience in control circuits, timers and relays. Five-day week. Housing available. Apply: Electrical Remote Control Co. Ltd., Bush Fair, Harlow, Essex. (S 256)

THE ENGLISH ELECTRIC COMPANY LIMITED

PROFESSIONAL ENGINEERING APPOINTMENTS

are available with the Switchgear Organisation of this Group on a range of Application and Contract Engineering duties. Experience in the manufacture, power generation and supply, or in the utilisation of electricity is sought, and professional engineers are invited to apply for consideration.

A number of vacancies also exist for younger engineers with Higher National Certificate in electrical engineering and preferably having served an engineering apprenticeship, which offer opportunity for acquiring experience, and scope for advancement and training as professional engineers.

All appointments are pensionable after a qualifying period.

Apply stating age, experience and qualifications to Dept. G.P.S., English Electric Hse, Strand, London W.C.2, quoting reference ET 401Q.

(S 251)

APPOINTMENTS WANTED

ADVERTISER seeks post with electrical firm, southern area. 30 years' electrical experience of all types of installations, measuring, ordering, records and office experience.—Box No. 8023, Electrical Times. (S 203)

FOREMAN ELECTRICIAN (45) seeks responsible position. 25 years' experience in domestic farm and factory installations. Used to handling labour.—Box No. 8045, Electrical Times. (S 319)

MANAGER in complete charge of Electrical Contracting Business with turnover of £80,000, seeks similar post in S.W. London area.—Box No. 8021, Electrical Times. (S 202)

POST required by INSTALLATION ENGINEER with electrical or interior decorating concern, preferably in London area.—J. A. Harvey, 77 Fulwell Park Ave, Twickenham. (S 321)

YOUNG MAN, O.N.C. (ELECT.), continuing studies, experienced control gear, D.O. test, etc., seeks interesting post with scope for experience and advancement. Lab. D.O. sales, etc., considered. Salary: £850. London Area.—Box No. 8007, Electrical Times. (S 139)

PATENTS

THE proprietor of British Patent No. 756681, entitled "IMPROVEMENTS IN OR RELATING TO ELECTRICAL THERMOSTATS" offers same for license or otherwise to ensure practical working in Gt. Britain. Inquiries to Singer, Stern and Carlberg, 140 So. Dearborn St, Chicago 3, Ill., U.S.A. (S 310)

THE proprietor of British Patent No. 753678, entitled "IMPROVEMENTS IN SNAP-ACTION ELECTRIC SWITCH," offers same for license or otherwise, to ensure its practical working in Great Britain. Inquiries to Singer, Stern & Carlberg, Chrysler Building, New York 17, N.Y., U.S.A. (S 311)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service, fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co. Ltd., Stanmore, Middx. (S 2)

EXCAVATION, CABLE LAYING, JOINTING, etc. Estimates free, prompt attention. All work guaranteed 12 months. Anywhere in Lincolnshire, Norfolk, Suffolk, Rutland, Cambridgeshire preferred but not essential.—W. T. Parker Ltd., 113-115 Station St, Burton-on-Trent, Staffs. (S 143)

WANTED

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper Ltd., 17 Brady St, Bethnal Green, E.1. (S 1)

FOR SALE

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co. Ltd., Honeypot La, Stanmore, Middx. Edgware 5566/9. (S 4)

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—Chi 5105, 7 Rothschild Rd, W.4. (S 3)

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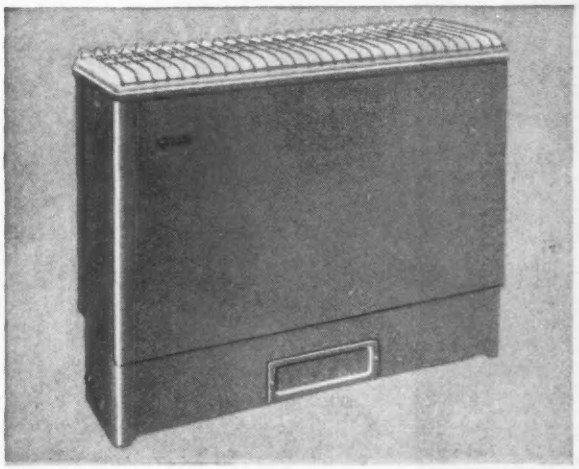

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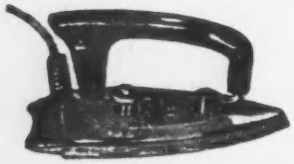

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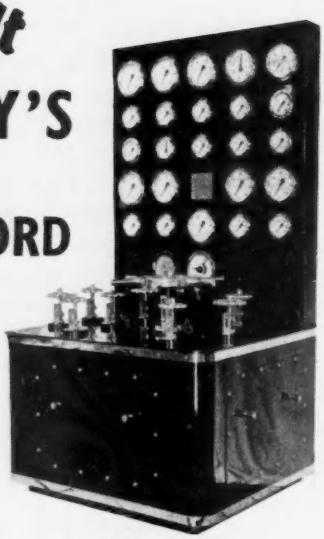

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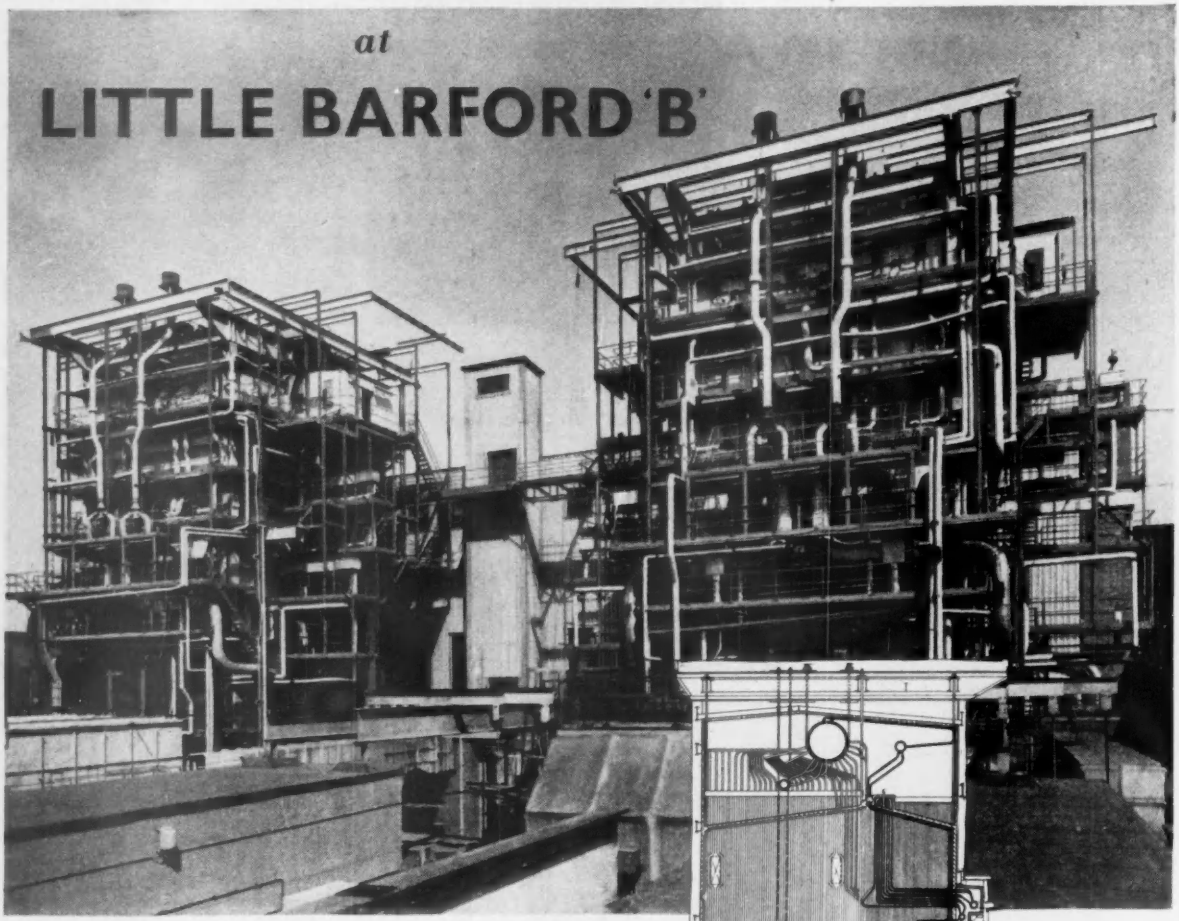

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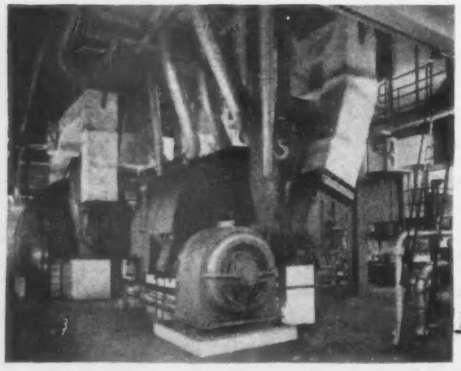

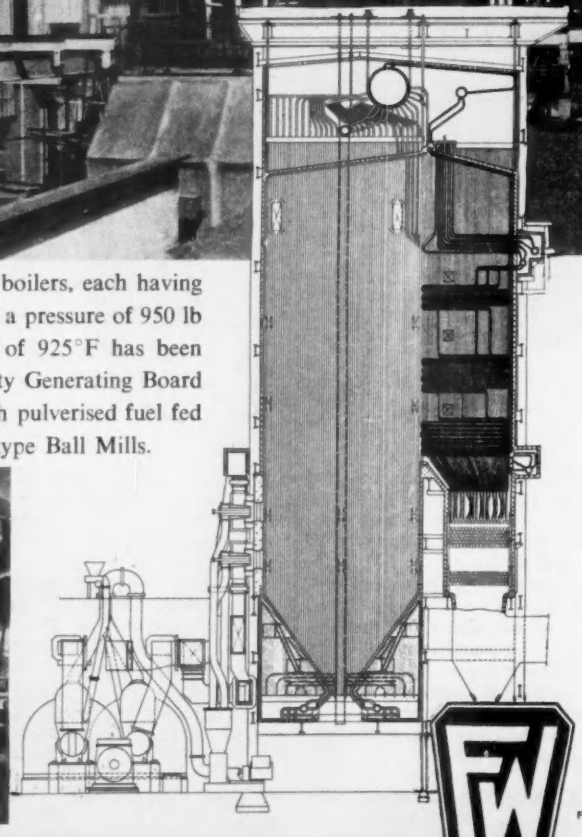

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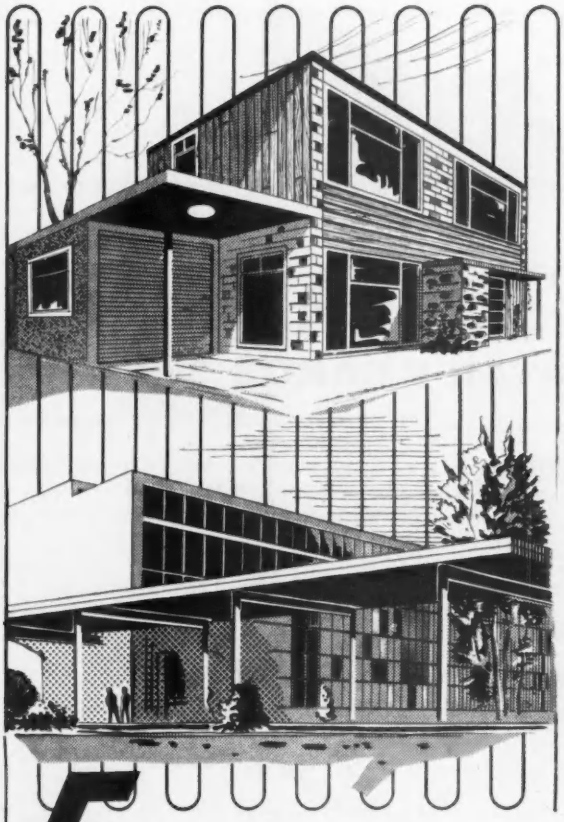

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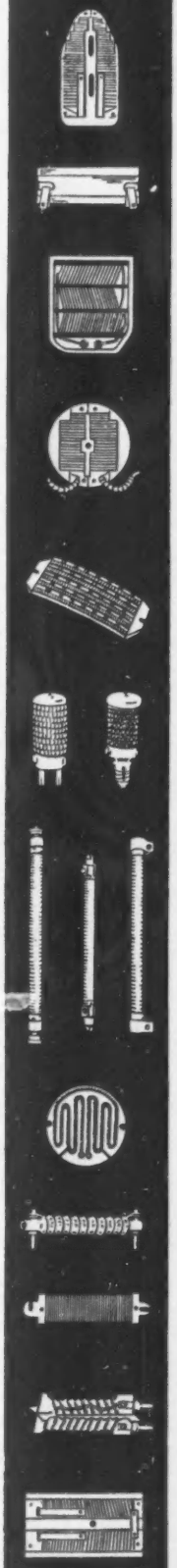

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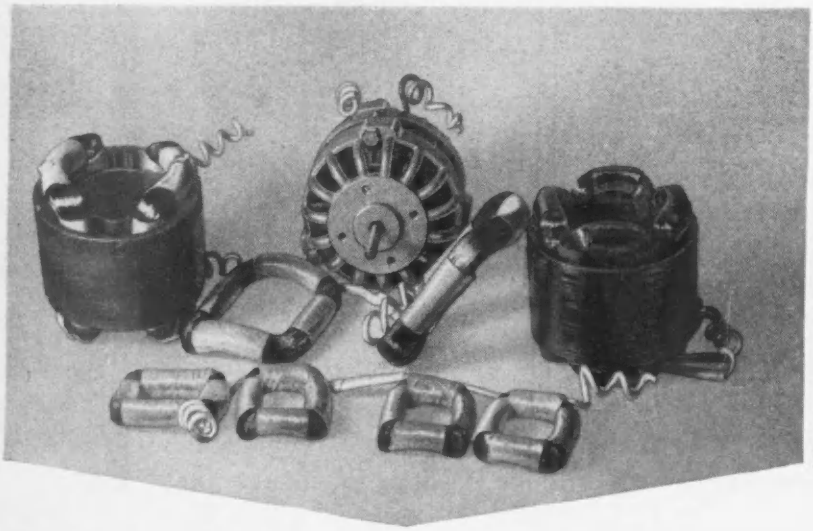

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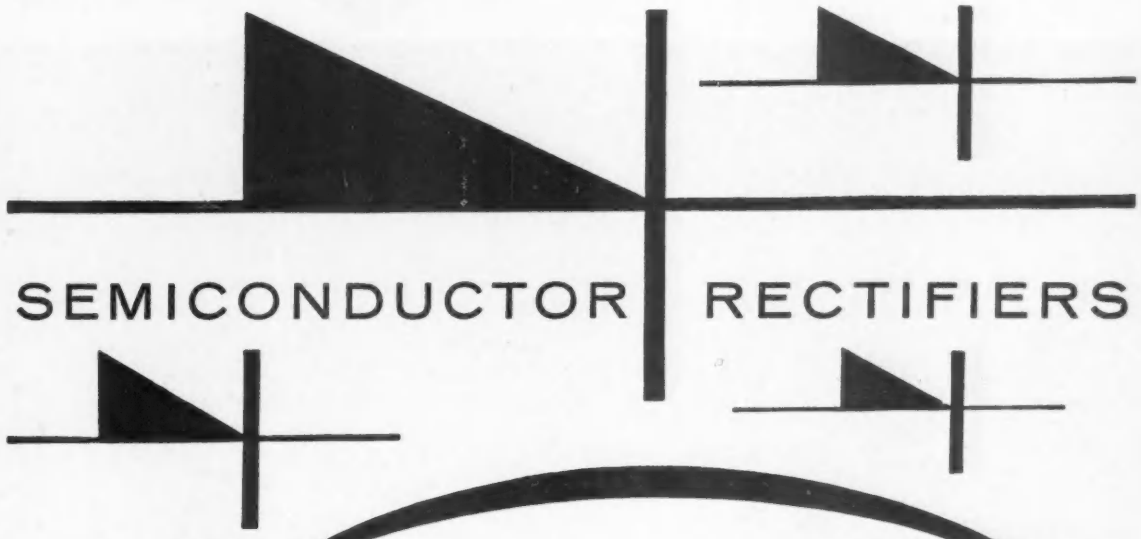

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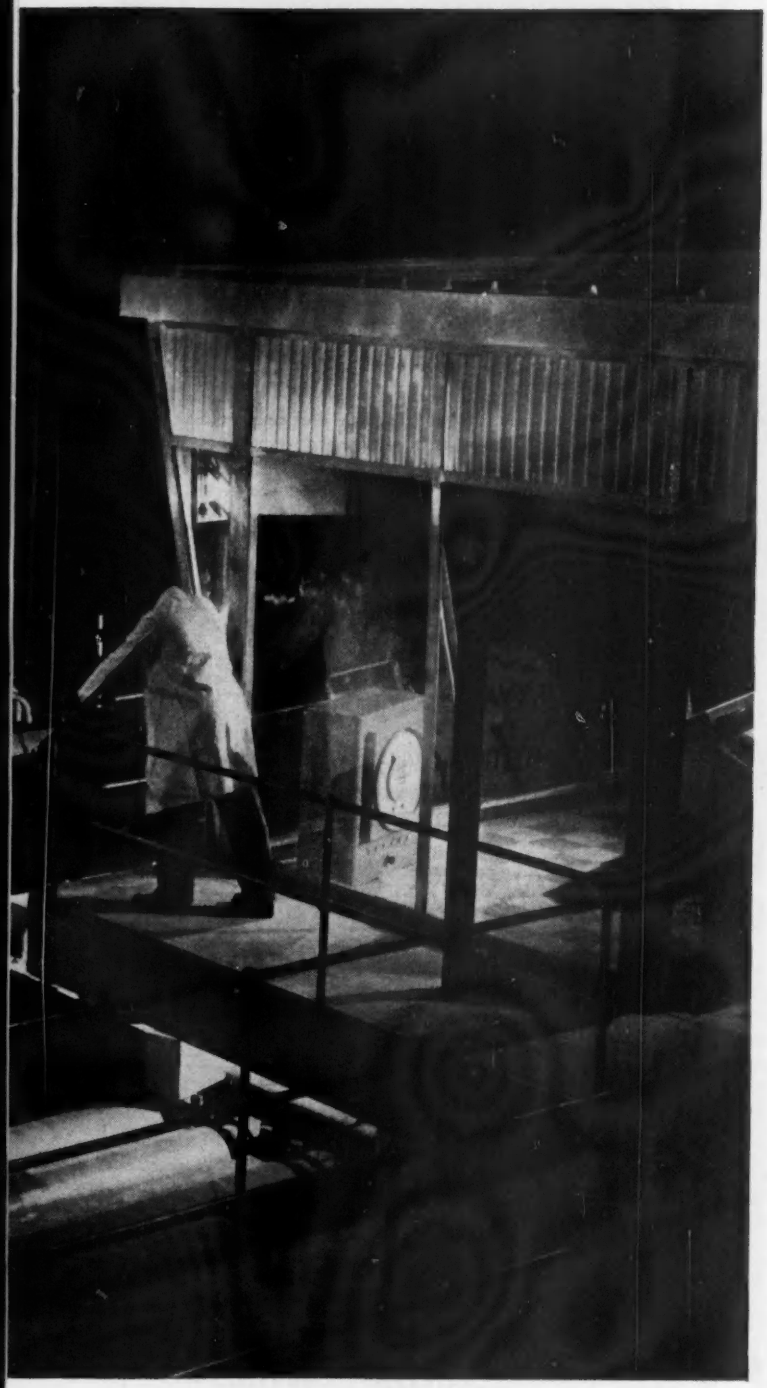

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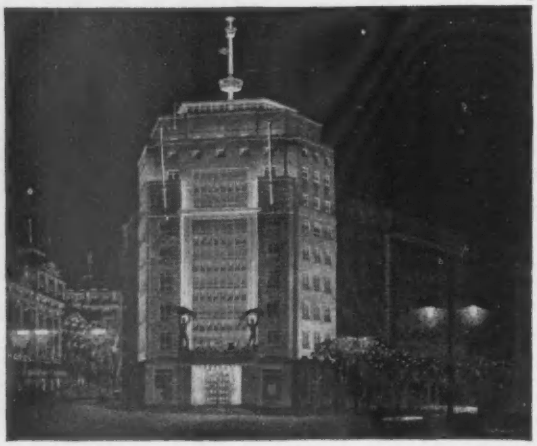

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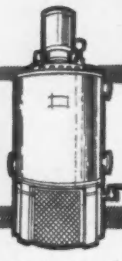

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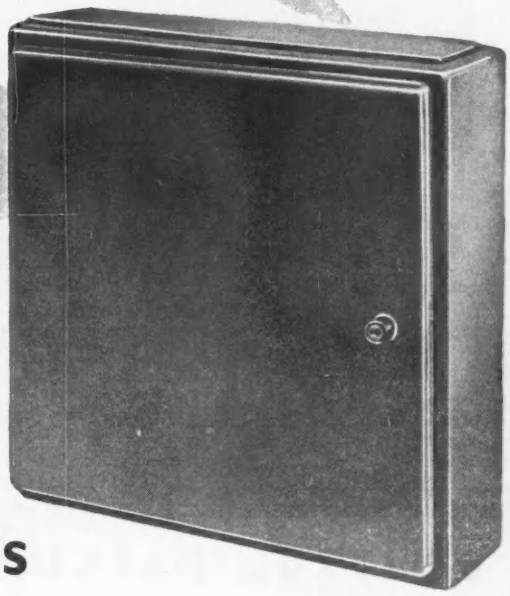

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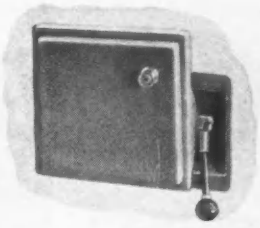

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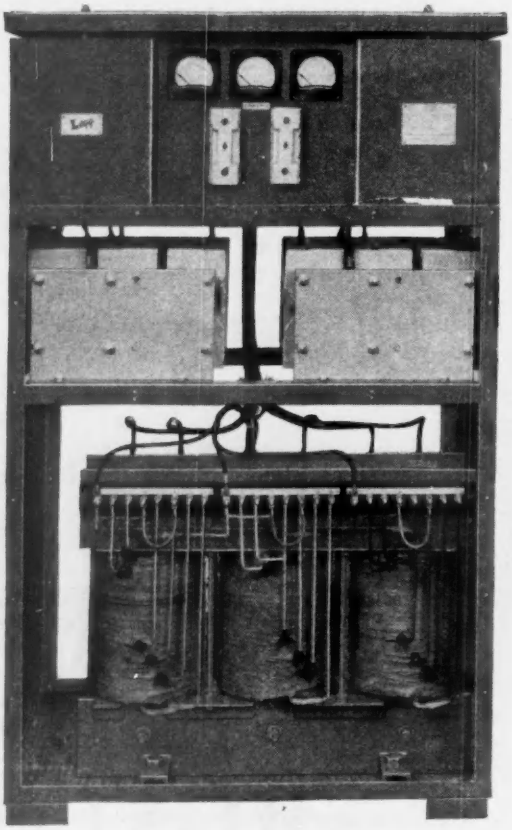

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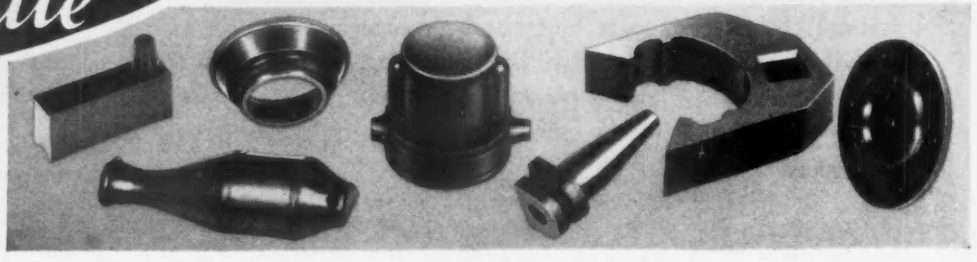

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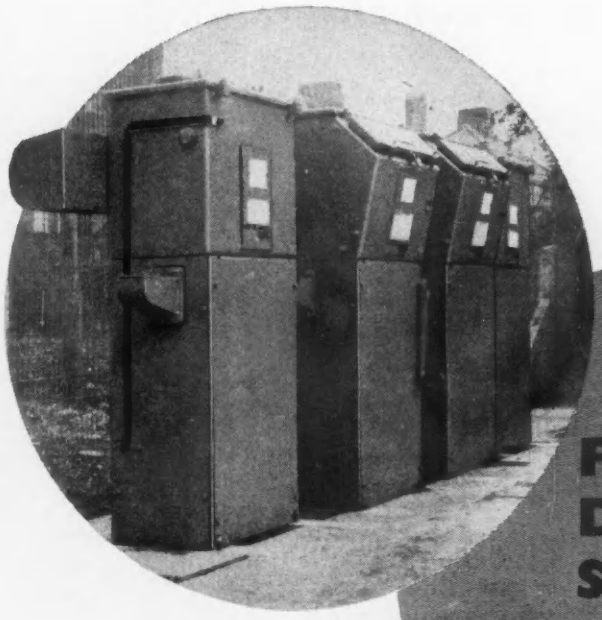

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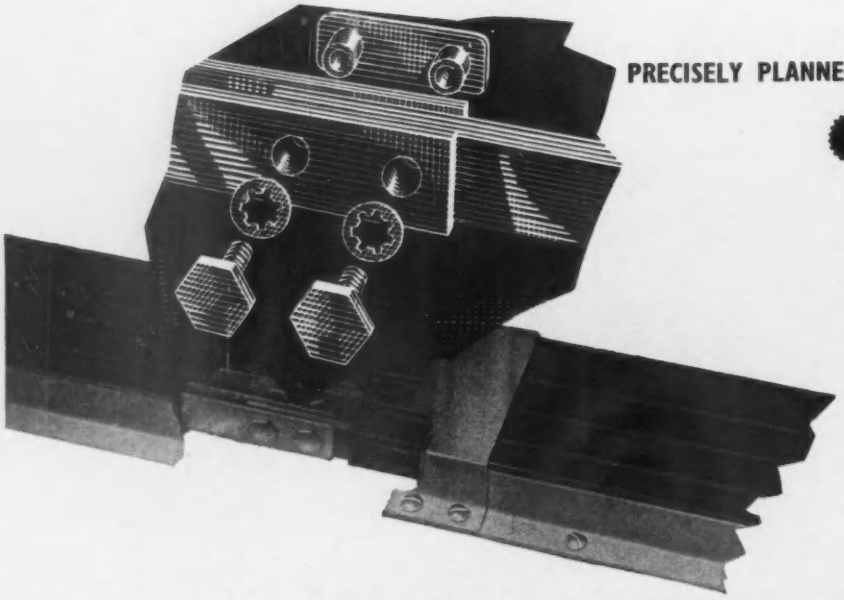

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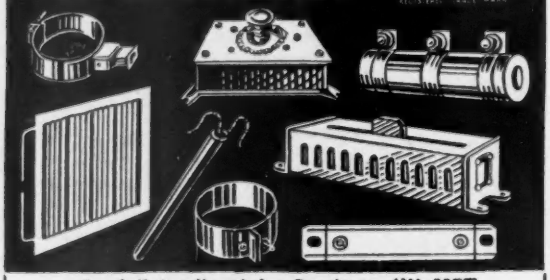

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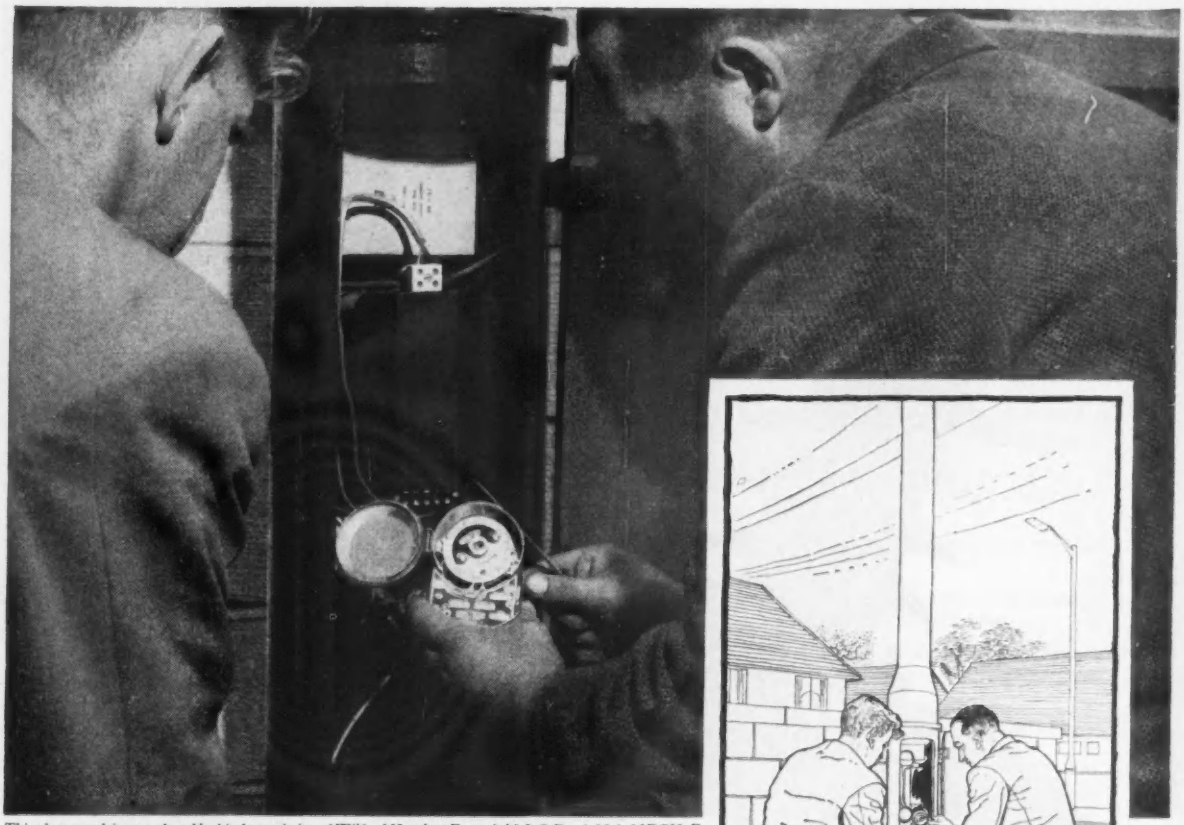

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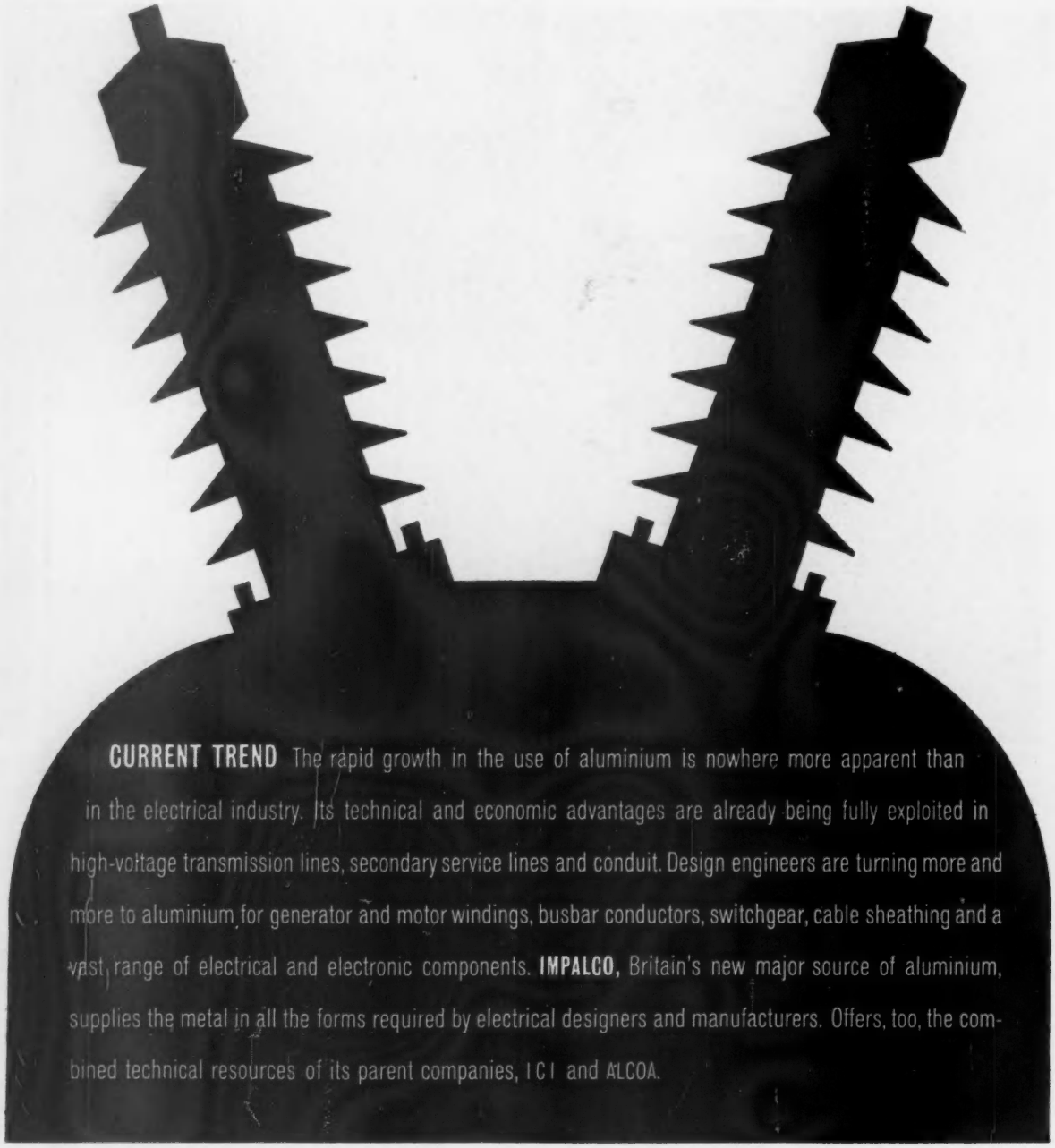

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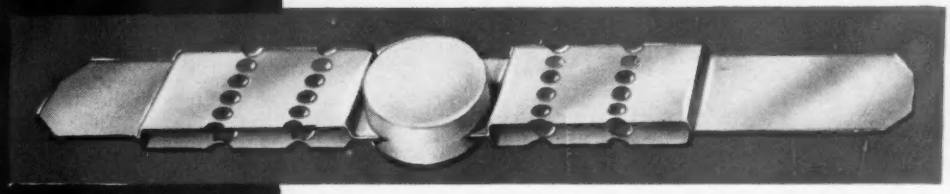

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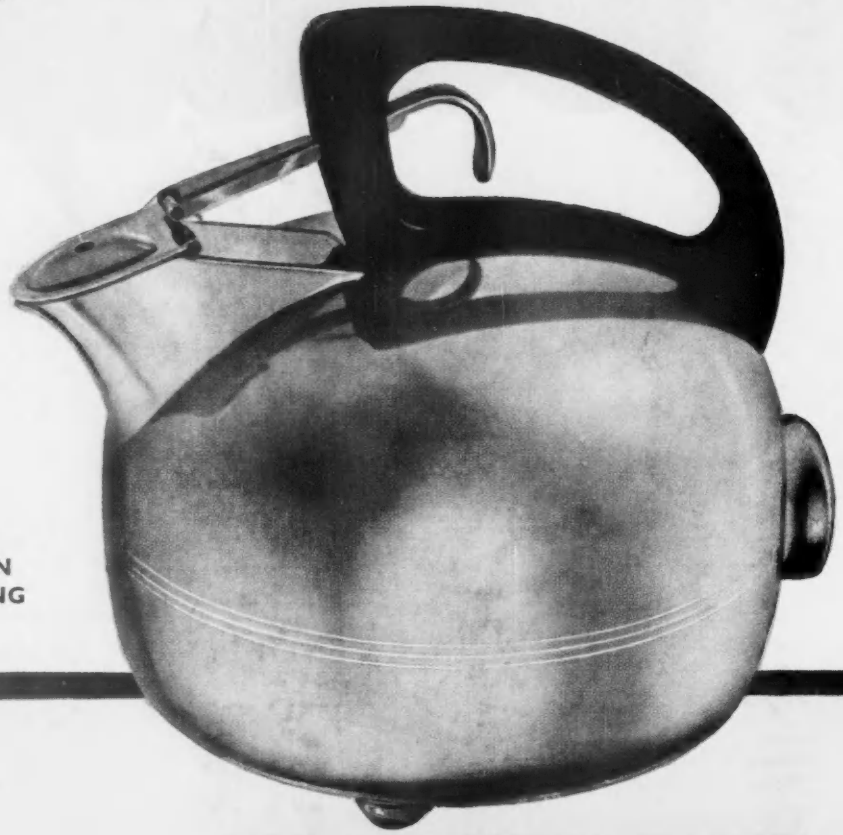

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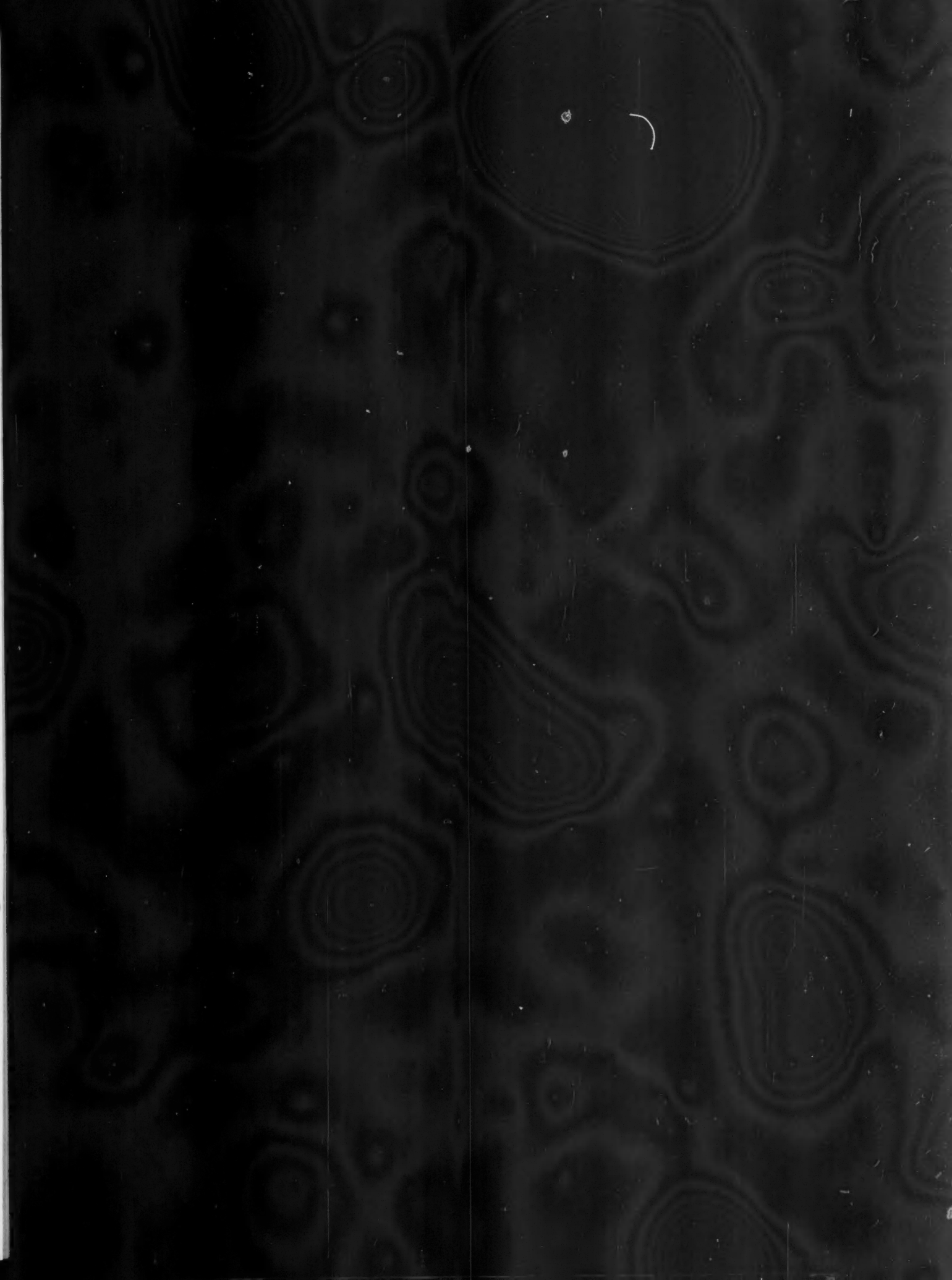
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